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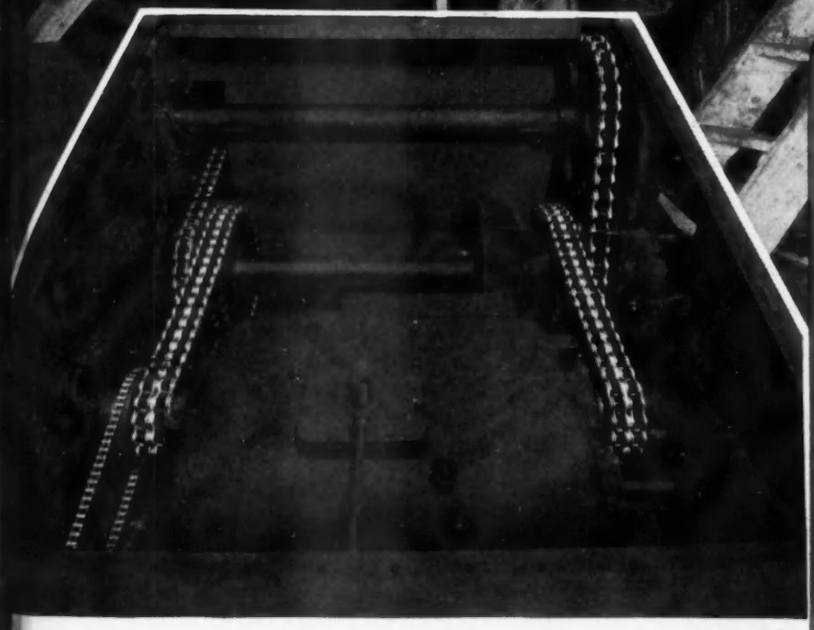

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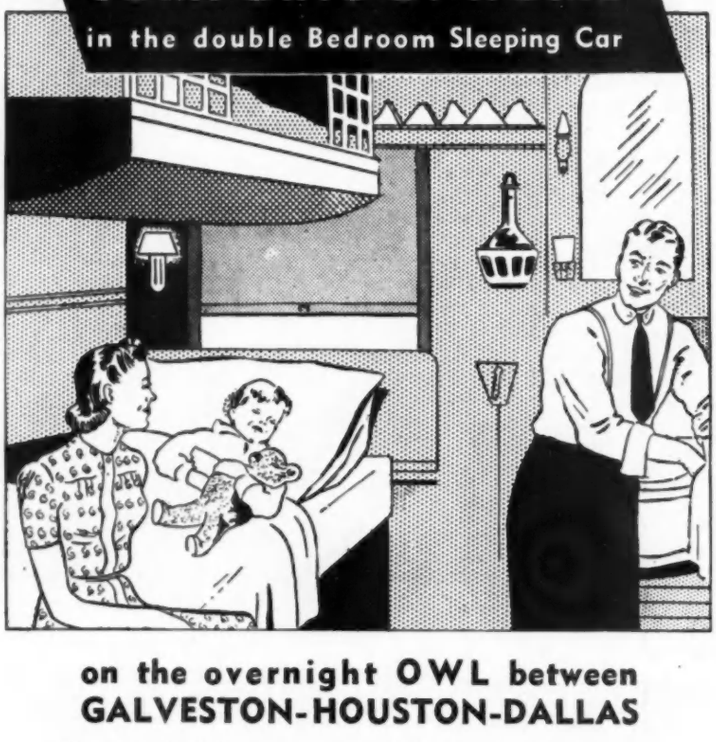

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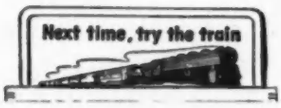

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Looking Ahead

WITH THE EDITORS

THE "MEETING" SEASON is on again, and those interested in keeping pace with engineering and technical progress will find as usual that they do not have enough time to get to all of the many interesting gatherings scheduled. What with the various district meetings of the API, the annual meetings of the AIMME and the AAPG, to mention a few, it is simply impossible to get around to all. Editors of THE OIL WEEKLY figured it up one year and found that it took more than 265 man-days to cover the more important oil conventions. But that is part of our work so don't fret if you have to pass up a meeting here and there because we will see that you get the highlights as well as the more important papers to be presented at ALL of these affairs.

MAYBE IT'S THE WEATHER but at any rate ye editor finds this a nice time of the year to check up on developments in Sunny California. But with no thought of alibi we will say that California operators always have something new and interesting to display at most any given time and readers of THE OIL WEEKLY will be informed of some such developments in articles that are being sought. It is a bit too early to tell what we have in mind but a number of engineers are being induced to prepare some articles that will be worth waiting for.

PRELIMINARY CONSIDERATIONS involved in cycling operations will be the subject of several highly important papers head-lining the program of the Southwestern District meeting of the API at Shreveport February 27 and 28. (See complete program this issue.) Details of the meeting will be recorded in THE OIL WEEKLY next week. Incidentally, engineers recently have decided that the term, "cycling," rather than "recycling," is the better way to describe this newer production method that is gaining widespread acceptance in southwestern high-pressure areas.

THIS WEEK, next week and every week THE OIL WEEKLY has an editorial feature that provides from 5 to 10 profit-making ideas that should find application on every modern drilling rig. We refer to the several pages devoted to "Practical Hints for the Drilling Rig" and if you are interested in drilling operations and haven't become a regular reader of this feature you are missing a real bet. Every item carries a "money-back-guarantee" if you don't find it worth more than a year's subscription to your favorite oil publication!

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THE OIL WEEKLY

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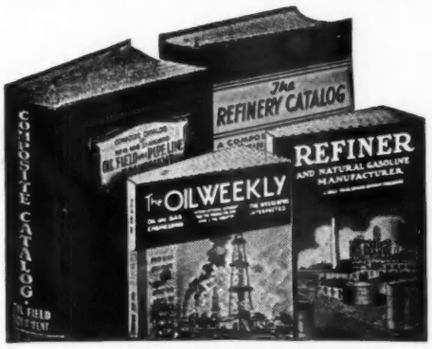

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The Oil Man's Calendar

FEB.	
24-25	Liquefied Petroleum Gas Association, Chicago.
27-28	American Petroleum Institute, Division of Production, Southwestern District, Shreveport.
MAR.	
1	North Texas Oil & Gas Association, Wichita Falls.
7	American Petroleum Institute, Illinois Basin Chapter, Mt. Vernon, Illinois.
11	American Petroleum Institute, Division of Production, Spring Meeting, Pacific Coast District, Los Angeles.
APR.	
1- 3	Society of Exploration Geophysicists, Houston.
2- 4	American Association of Petroleum Geologists, Twenty-sixth Annual Meeting, Houston.
3- 4	Society of Economic Paleontologists and Mineralogists, Houston.
7-11	American Chemical Society, St. Louis.
15-17	Southwest Gas Measurement Short Course, University of Oklahoma, Norman.
16-18	Western Petroleum Refiners Association, Hot Springs, Ark.
17-18	American Petroleum Institute, Division of Production, Eastern District, Pittsburgh.
23-25	Petroleum Industry Electrical Association, Tulsa.
23-25	Natural Gasoline Association of America, Dallas.
24-25	National Petroleum Association, Semi-Annual Meeting, Cleveland.
MAY	
2- 3	Petroleum and Natural Gas Conference, State College, Pa.

Contents « February 24, 1941

Volume 100, Number 12

The Changing Panorama..... 11

Feature Section:

Germany's Oil Supply Apparently Adequate for Her Needs 12
BY RAY L. DUDLEY

Mexico's Petroleum Problem Nearer a Solution..... 14

A. I. M. E. Holds Annual Session in New York..... 17

Development of Shooting Practices for Multiple Zone Completions 21
BY R. C. GRAHAM AND J. R. THOMPSON

Developments in Plug-Back Work in East Texas..... 26
BY W. H. WIGINTON

Portability in a Rig Set-Up..... 39

Practical Hints for the Drilling Rig..... 42

Export-Import Situation Only Market Threat..... 45
BY W. H. STRANG

News Section and Index..... 53

Looking Ahead With the Editors..... 2

Notes for the Equipment Buyer and User.....103

Squeaks From the Bull Wheel.....106

Index to Advertisers.....108

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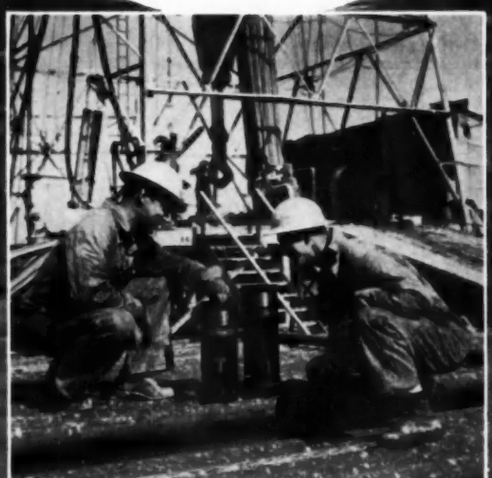

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THE OIL WEEKLY

FEBRUARY 24, 1941

VOLUME 100 NUMBER 12

The Changing Panorama

THE National Congress has before it a bill which would place a tax of two cents per gallon on fuel oil. This measure is proposed by the same member from Pennsylvania who is sponsoring a resolution which would extend the Guffey Act—and the Guffey Act is federal control of the coal industry. Workings of the act, which was conceived first as a measure to aid mine workers, has had the effect of raising the price of coal to levels profitable to the least efficient of the coal producers. These uniform and higher coal prices encourage use of oil fuel, and the higher the coal price goes the more oil becomes competitive. Mine owners who have efficiently operated low-cost workings would rather compete with oil on an open basis without federal interference. But the less efficient mines and the labor group are inclined to hold to the government set price and control the oil competition by the tax method or through bringing the oil industry under the same kind of domination that is boosting the cost of coal to the consumer. The consumer, incidentally, is the one party always overlooked when special groups and the government team up to control an industry. In the meantime, it is well that the oil industry keep in mind that certain elements in the coal industry and a powerful labor group are among those who would like to see the oil industry under federal control.

Extension of the Guffey Act by the present Congress should be vigorously opposed by those interested in keeping the oil industry free of federal control. Any control measure directed at a natural resource industry will be used by the government as a basis for the ultimate control of all such groups.

Germans Overlook a Point . . .

The article by Dr. Hans Bahr of Hamburg, Germany, published in THE OIL WEEKLY, [February 10, Page 16] setting out the German idea of the "new order" with reference to petroleum in Europe and the Near East, which originated in Berlin, and which will be generously given to Europe at the point of a bayonet, disposes of England's part in European petroleum affairs with the typically German naive statement, "So far, in all these questions, the oil supply of Great Britain was deliberately disregarded, as it stands outside the European block." At this point we should have put an exclamation point!

One important thing Dr. Bahr, and other Germans seem to have overlooked is that English and American participation in Europe's petroleum history is the result of an aptitude for the petroleum business which Germany has never had. The development of Russian petroleum resources before the first World War saw English, Dutch and American influence and capital (not to mention that of some other countries) but none of Germany. The same thing applies to Roumania. Even in Hungary, far more closely adjacent to Germany than to England or to America, it has been American effort which has made the start in Hungarian oil history. And finally, new fields within Germany itself during the past few years have been found by Dutch, English or American companies.

Look at it any way you may, Germany can cry with little grace that she has been ruled out because of strictly political reasons. Political reasons possibly have entered into the picture—but aptitude for the industry may be said to be the basic reason. And it is easy to understand the flow of crude petroleum toward the country which developed it.

Employment and Income Up

Non-agricultural employment of over 37,000,000 workers at the end of December represented an increase of 1½ million from a year previously, with the manufacturing and construction lines accounting for the major increases. Employment in construction is 40 percent greater than a year ago, and factory employment now stands at the highest total ever recorded.

In reflection of year-end dividend and interest payments and the exceptionally large volume of business activity, income payments increased in December to the highest dollar total since October, 1929.

Miscellany Notes . . .

Rawleigh Warner, treasurer of The Pure Oil Company, Chicago, may be appointed assistant secretary of the Navy by his old friend Colonel Knox, Secretary of the Navy. . . . If Congress fails to enact legislation for federal government ownership of Southern California off-shore tidewater oil fields, Attorney General Jackson may start legal proceedings to achieve that purpose . . . Admiral William D. Leahy, United States ambassador to France's Vichy government, reportedly has promised American gasoline and oil to General Weygand's French army in Africa if France will stand pat against German demands for French Mediterranean sea bases. . . . The 1000 airplanes and 2400 airplane engines being manufactured monthly in the United States at present will shortly increase materially, as new manufacturing plants are about ready for production.

Germany's Oil Supply

Apparently Adequate For Her Needs

By RAY L. DUDLEY
Publisher, The Oil Weekly

WHAT actually is the situation in Germany with reference to its oil supply? Is there a shortage of aviation or other gasoline, or lubricating oils, or is Germany well supplied?

After making every possible check into available information, the conclusion presents itself that there is no shortage of motor fuel, aviation gasoline, lubricating oil, or the other petroleum products Germany needs in carrying on the war, unless it be in certain high-grade lubes.

The seizure of Roumanian oil fields solved Germany's problem—but most people familiar in part with the situation in Germany believe that the coal hydrogenation processes, used on an extensive scale in Germany, are furnishing the major portion of her aviation requirements. Use of coal products for aviation fuel is not new in Germany. She made use of such products in World War No. 1 and has vastly expanded facilities for producing such fuels. They are not as desirable as American aviation gasoline, but obviously they have furnished fuel for some fast service.

At this time Germany not only has synthetic plants making fuel, but is getting oil supplies from the following other countries: Roumania, Austria, Poland, France, Hungary and Russia.

A short time prior to the beginning of the war, a new field was discovered in Germany, proper. It was reported to be producing at the rate of 5000 barrels per day when the war started, and reports now indicate that it may be producing as much as 10,000 barrels daily. It is a deep-seated salt dome.

Recent information would indicate that estimates of Germany's production in 1940 have been too low, and that the country as a whole may be producing as much as 6,350,000 barrels annually, or roughly in excess of 17,000 barrels per day.

Polish fields, which were included in the area taken by the Russians, are reported to be redoubling their efforts at production with the oil going to Germany, but competent authorities do not believe it possible for the Germans operating the Polish oil fields to show a material increase in production there, and an estimate of 5,000,000 for the year might be high. There was a demand for all Polish crude oil which could be produced prior to the war, and it is held as unlikely that material increases have been made.

France in 1939 produced about half a million barrels in a year's time, and any increases would not materially affect the total supply.

Hungary's production is now around 7500 barrels per day, a material percentage increase. A new field has been brought in in Hungary since the war started.

Roumania's production, which had dropped to a low point in the early fall of 1940, is now estimated at around 100,000 barrels per day. This is a very substantial increase and obviously affords a big relief to Germany, although Germany was getting a large supply from Roumania before she seized the country. However, the storage situation in Roumania is getting difficult. Germany is taking principally kerosene and gas oil for tanks, trucks and submarines, having found it unnecessary a short time ago to take in large quantities of gasoline. Spread of the war to the Balkans likely would mean drawing from Roumanian gasoline stocks. On the other hand, the threatened bombing of Roumanian oil fields, or storage tanks, could easily cause a drop in the supply which might prove embarrassing.

Austria, whose production prior to the war was negligible, has unquestionably had a substantial increase during the past 17 months. Just prior to the beginning of the war a new field had been opened with better prospects for production than Austria had ever had. A few months prior to the beginning of the war Austrian daily production was only slightly above 2000 barrels per day. Today it is in excess of 7500, with this figure possibly being too conservative. Czechoslovakia's production, however is

quite small. Jugoslavia is at present the scene of a search for oil by German interests, with no production.

Russia's participation in Germany's oil supply represents an unknown quantity. One month one hears that Russian tankers are crowding Baltic ports with oil for Germany. Then it is heard that Russia is in no position to supply Germany. A few days ago we heard that Russia's domestic demands are around 685,000 barrels per day, which, if true, is probably more than the country is producing. It is a fact that American gasoline has been going fairly steadily to Vladivostok at the rate, roughly, of two tankers per month of motor gasoline and it might easily follow that Russia can sell Germany certain products for such a high price as to make it more advantageous for Russia to import gasoline into her Far Eastern areas than to ship it from Western Russia to the Pacific Coast.

Last week a new dispatch from Bulgaria referred to a train of 39 tank cars loaded with aviation gasoline from Russia, destined to Germany, being blown up inside the Bulgarian border, which does tend to confirm the reports that Russia is sending oil to Germany.

Summing up the situation on Germany's crude oil supplies, she has the following available from within her own boundaries, or controlled nations:

	Bbls. Daily
From within Germany	17,300
From Roumania	100,000
From Hungary	7,500
From Austria	7,500
From Poland	13,700
From others (France, and Czechoslovakia)	1,700
Total	147,700

Of course, it is likely that the domestic demands in some of the above countries, particularly Austria, Hungary and Roumania will call for the consumption of at least part of the production, although if the need arises Germany could invoke even greater restriction on domestic usage in those countries than now prevails.

Added to the foregoing, is the undetermined amount of synthetic products made in German hydrogenation plants.

In 1938, according to information appearing in the July 19, 1940, issue of the German publication *Wirtschaftdienst,* German synthetic production was 17,800,000 barrels, or 48,766 barrels per day. Unquestionably this production has seen a tremendous increase since 1938. We have heard of estimates running to far more than twice the 1938 production, but such an increase would represent a gigantic construction job for the time involved. It would be very conservative, however, to assume that such synthetic production has been increased by 50 percent, although this must be given as a pure guess.

Thus, if synthetic production *has* been increased 50 percent since 1938, this, added to the total crude available, would bring the figures up to 220,850,000 barrels per year, with Roumania as the principal source of supply.

Various reports have been circulated recently to the effect that Germany's real need in petroleum is for lubricating oil. Real information is difficult to secure and it would appear to us that the reports were based purely on individual opinion without much fact to stand on. There have been great advancements made in the manufacture of lubricating oils from stocks not previously considered ideal lube stocks. There is no reason to assume that German chemists are unable to manufacture sufficient lubricating oil for Germany's needs from available stocks of crude oil.

But while it is understandable from information developed that Germany has sufficient supplies of fuel and lube, it is equally understandable that stocks could easily be down or out at important points due to bombing of supplies themselves, or of lines of communication. It is entirely possible that at the end of the blitzkrieg in France and the Low Countries last summer, the German fuel and lube supply, as a result of extraordinary usage, and of lack of necessary stocks at possible invasion points, was too low to carry on an immediate invasion of Britain.

Concentration points of fuel undoubtedly have had more attention from the R. A. F. than have the refineries or hydrogenation plants themselves. Apparently the refineries in Germany proper have no more been put out of commission by the R. A. F. than have English plants been put out of commission by the German air service.

There is a wide divergence of opinion as to the amount of crude petroleum and petroleum products captured by the Germans when they overran the Low Countries and France. We have heard it placed as high as 50,000,000 barrels which is unquestionably too high. The amount actually captured—in some places little or no attempt was made to destroy it—may not have been more than 10,000,000 to 12,000,000 barrels.

And in addition to the foregoing it should be remembered that Germany had been accumulating stocks of gasoline and other petroleum products for some time before the war started and that it was Germany who actually chose the timing for the war. This would indicate that Germany must have had ample stocks for a sizeable campaign or she would never have undertaken a campaign which is essentially a campaign of petroleum (or petroleum substitute) fuels.

—International News Photo

Roumania's oil fields, including the one at Dambrovitza, pictured here, currently are supplying Germany with 100,000 barrels of oil per day.

Mexico's Petroleum Problem Seems Nearer A Solution

RUMORS of settlement of the Mexican oil controversy have multiplied progressively ever since Manuel Avila Camacho took office as president of Mexico. His election was sponsored by Cardenas, whose expropriation of the oil properties was his supreme act of a new order in Mexico. But immediately as Camacho took over, it became apparent that the policy of the government was turning more toward the ideas of government and property that obtain in the majority of American republics. Then, too, it had been shown under Cardenas that operation of the oil industry by the government was not the profitable venture it appeared at the outset. Inefficient operation and loss of markets combined to engender a financial loss that the government's economy was not able to absorb. The only governments friendly to such tactics as were Cardenas' are behind Britain's blockade, and the good neighbor policy of the big country to the north was cooled by policies of which that neighbor's nationals are the victims. All these combine into a situation comparable to having a wildcat by the tail. How Mexico is going to turn loose is yet Camacho's problem. Perhaps the world situation which demands that all nations put themselves in one of two camps will bring about a solution that three years of negotiation between the former owners of the Mexican oil industry and the government of that country has not been able to reach. The losses of all concerned during those years will remain losses, but an end to those drains seems nearer now than at any time since the controversy began.

MANUEL AVILA CAMACHO
President of Mexico

MARKED stimulation of the belief that the three-year impasse between the Mexican government and the American, British and Dutch oil companies whose properties were expropriated in 1938, is scheduled to be succeeded soon by an agreement that may solve Mexico's tensing petroleum problem, is growing in the wake of the current negotiations between the United States and Mexico for the settlement of all pending problems between the two nations.

The Mexican government has made plain in the past its view that the controversy over the expropriated oil properties is a matter between itself and the companies affected. This view was last officially expressed when Mexico refused proposal by the American State Department that the oil issue be submitted to international arbitration.

However, the changing international situation, the growing talk of continental solidarity and defense, and Mexico's alignment with the democracies has had a tendency in recent months to lessen the bitterness of continental disputes and to encourage the amicable settlement of internal controversies that might militate against the most effective continental cooperation.

Consequently, whether or not the oil question is included in the category of problems between the United States and Mexico for which a sort of en bloc settlement is being sought, rather well sustained opinion holds that the time is propitious for adjustment of the oil issue and that existing conditions present strong arguments for such an adjustment.

While there is some reason to believe that the oil companies would make certain concessions to achieve a settlement, there is little reason to believe, if the opinion of sources heretofore found reliable means anything, that the companies would enter into any arrangement with the Mexican government that would make them mere agencies of the government.

Five Basic Objectives

The most reliable reports invariably return to the five basic objectives outlined in the Cardenas-Richberg conferences in Mexico City and Saltillo in 1939 as the most likely bases of any settlement that may be reached.

These stated objectives, to quote from Richberg's own story of the conferences with Cardenas, are as follows:

1. Provision through the medium of a long-term contract for the operation by the respective companies of properties taken, in accordance with the terms of the contract, free from restrictions,

claims or obligations not embodied therein.

2. A fixed schedule of rates definitely determining all taxes and similar payments to be made during the life of the contract.

3. A reciprocal guarantee for the life of the contract, of reasonable and workable labor conditions.

4. An appropriate measure and means of reimbursement for losses sustained by the companies to date of contract by reason of seizure of properties on March 18, 1938.

5. Upon expiration of the long term contract all claims and interests of companies in producing properties in Mexico to be released and transferred to the Mexican government without payment of any further consideration.

These objectives contemplate, in brief, operation of the properties by the companies over a long period of time, without restrictions from the government and under guarantees of freedom from labor trouble. During the life of the contract the companies would pay specified taxes and make other payments to the government. In addition the companies would be allowed reimbursement for losses sustained by reason of the expropriation and would be enabled during the life of the contract to earn a reasonable profit. At the end of the contract, the properties would be transferred again to government operation without payment of further consideration.

Through application of such a plan, profit to both the companies and the government is seen. It will be recalled that negotiations on the basis of the five objectives cited were arranged through the Mexican embassy in Washington and began in Mexico City March 8, 1939, or just about a year after the expropriation. These negotiations were conducted between President Lazaro Cardenas, Donald R. Richberg as representative of the oil companies, and the Mexican Ambassador to the United States Francisco Castillo Najera. The major groups of all foreign investors in the expropriated companies were represented by Richberg.

Eight conferences were held in Mexico City, from March 8 to March 22. Another conference was held between Richberg and Ambassador Castillo Najera at San Antonio April 27. This was followed by a renewal of talks between Cardenas and Richberg at Saltillo. At the conclusion of the latter conferences, on May 3, a joint statement was issued, as follows:

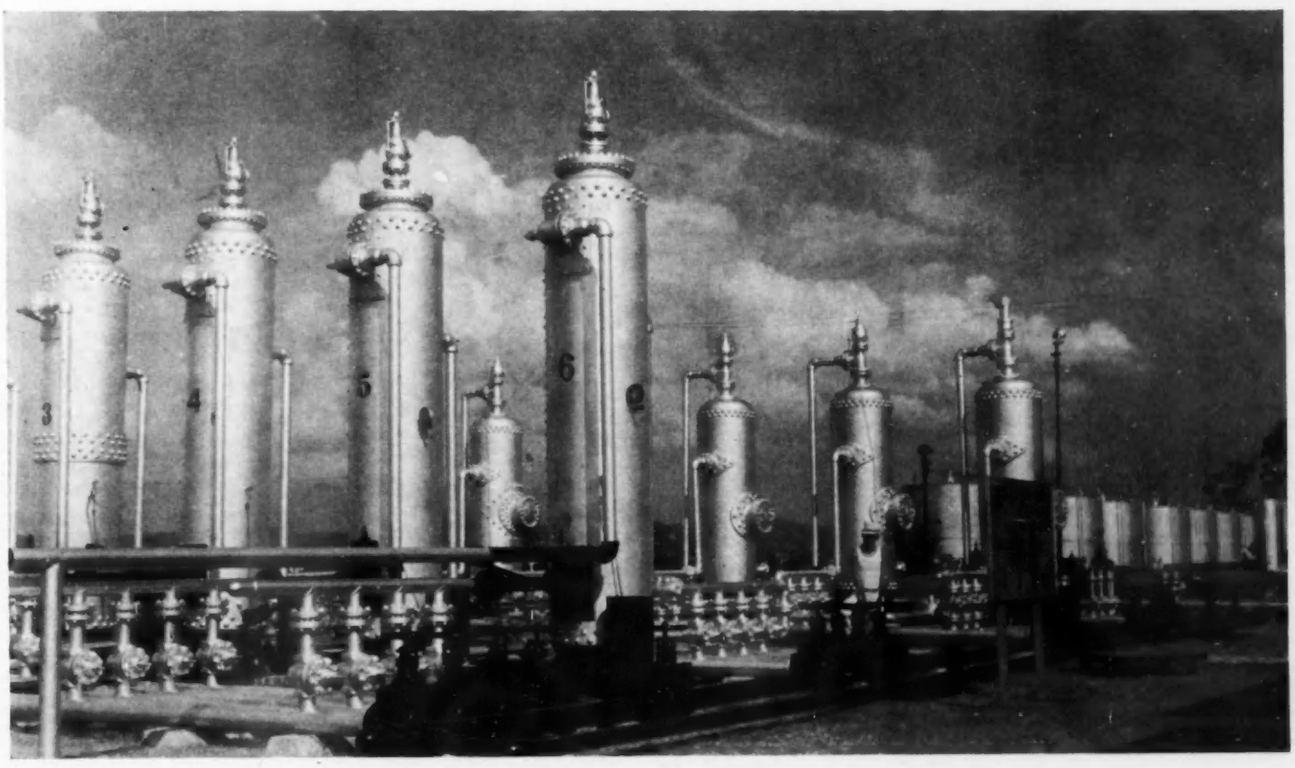
"The discussions have been fruitful, and effective progress has been made toward a mutually satisfactory agreement. . . . It is anticipated that in the near future the negotiations will reach a definite conclusion without the need of further oral discussions between President Cardenas and Mr. Richberg."

Two Troublesome Points

Two particularly troublesome points arose in the Cardenas-Richberg discussions. The first was insistence by the government that the expropriated properties should be valued as a basis for fixing some of the terms of the contract under discussion. The other was similar insistence by the government that it should retain management of the properties. No agreement on these points was reached.

Then, six weeks after the final Saltillo conference, the Cardenas government stated its position, insisting upon proposal to fix a valuation for the properties and to provide for payment in slow installments out of a percentage of the oil produced.

Richberg and Castillo Najera later collaborated in the draft of a "preliminary agreement as basis for contracts to be negotiated in settlement of oil question," this being substantially in accordance



Poza Rica is considered one of the richest oil fields in the world, and at the time of expropriation by Mexico was among the best equipped, as the picture below indicates. But multiplication of costs under the labor program, lack of administrative skill and closing of markets have offset the advantages of prolific wells and mechanical efficiency to the point that Mexico's experiment in nationalization of its oil industry has piled up financial deficits that would concern governments with far greater income sources than Mexico can command.

with the five basic objectives originally set forth.

The new draft provided that each group of investors would consolidate its interests in one new Mexican corporation, with a majority of the board of directors Mexican, the board to appoint the manager of each corporation. Furthermore, it was proposed that the Mexican government would make a long-term contract with each Mexican corporation for the development of properties described in the contract, these properties to be released to the government at the expiration of the contract. In final analysis, the proposal put unrestricted operation in the hands of the companies, with supervisory check in the hands of the government to see that contract requirements were carried out. Labor protection was specified. The proposal specified guarantee of assured revenues for the government and division of income from foreign exports between the government and the companies.

But the negotiations broke down when the government later took the position that the corporations to be organized to operate the properties should be under the absolute control of the government.

There have been numerous reports in the Mexican press in recent weeks that settlement of the oil question is near. These reports have had various versions. Some have predicted that the oil companies would take over the technical management of the industry, the government retaining administrative direction. There have been reports that the Royal Dutch Shell has initiated negotiations with Mexico through representatives in the United States. It has even been rumored that the British claims, provided satisfactory settlement can be made, have been pledged to the United States as collateral on United States aid to Britain.

Irrespective of how true these reports are, their persistence apparently indicates renewed negotiations. The reports that the ousted companies may again operate the expropriated properties under arrangement with the government were received favorably by the workers in some quarters, certain press comment indicated. *El Mundo,* Tampico newspaper, early in January went so far as to say: "The oil workers received this news (that the companies may again participate in the operation of the properties) with pleasure, for it is felt if the government retains control of the industry and the companies are in charge of technical operations, there is hope that activities will be intensified, that personnel dismissal will not be necessary, and even that more personnel will be hired."

Indicative of the lines along which settlement is being considered, *El Mundo* added: "Return is being made to the plans for cooperation between the government and the companies which President Cardenas rejected after having accepted them in principle in the conferences he had with Mr. Richberg in Saltillo."

Government sources, however, have declined any comment on the matter. The companies have in no wise retreated from their original stand that they should get prompt, adequate compensation of the return of the properties for unrestricted operation on a long-term contract. This position is explained in Richberg's account of the negotiations he undertook on behalf of the companies: "It can be fairly said that the property losses resulting from the confiscation of the oil properties, although enormous, are in a long view not so important as the destruction of established principles of justice and fair dealing upon which all commercial and social intercourse between nations must depend. Those principles, when under attack by one government, can only be effectively preserved by their vigorous defense by other governments properly concerned to uphold them."

Mexico, in turn, has shown no inclination to deviate from the position it has taken, that the expropriation will stand, that the foreign companies are to have no free hand in future operation of the properties, that compensation is to be paid over a period, that the government will deal only with the companies.

International Influences

Whether the international situation will influence stronger action by the United States State Department than has so far been taken is problematical. The Mexican industry needs money badly, tankers, new refinery equipment. Mexico needs money and the United States is the most likely and most promising source. If payment of compensation for the expropriated American oil properties should be placed in the same category as payment for agrarian claims to United States nationals who have suffered expropriation in Mexico, and thus made one of the problems toward which settlement negotiations have been carried on so energetically in recent weeks, then some early adjustment of the question might be reached.

In the meantime the government's effort to reorganize the oil industry on a stable basis continues. Dismissal of employes, called for under the reorganization plan, is causing anything but harmony in workers circles. By the early part of February, some 1200 workers had been dismissed in the Northern, Southern and Central zones. But 1700 more are slated for dismissal in the effort to cut down Petroleos Mexicanos enormous payroll. Whereas the foreign companies had about 14,000 employes at the time of expropriation, the number under government administration was rapidly increased to about 18,000. The dismissed workers have been filing suits against the government administration before the labor board which authorized the dismissals. In the wake of the dismissals, unrest and discontent is growing in the workers' ranks. Petroleos Mexicanos is not paying dismissal compensation, required generally under the labor laws.

The financial condition of the industry grows more and more unstable. Estimates from well informed and reliable sources place the deficit of Petroleos Mexicanos from March 18, 1938, to 1940 at approximately 62,000,000 pesos, and for 1940 at 85,000,000 pesos, or a total since government operation began of 147,000,000 pesos. At the current rate of exchange that is around $29,400,000 for a period of a little less than three years.

In arriving at the deficit from the time of expropriation until 1940, it is pointed out that Minister of Finance Eduardo Suarez admitted the oil administration owed the government and the banks 22,000,000 pesos at the end of 1939. In addition Petroleos Mexicanos had a credit of about 20,000,000 pesos in Germany for oil sold the Nazi nation. Another 20,000,000 pesos is declared accounted for in accounts receivable for oil delivered to Eastern States refinery at Houston from August, 1938, to March, 1939.

The deficit cited represents merely the difference between receipts and disbursements, without taking into account depreciation and other items.

Petroleum Takes Spotlight At A. I. M. E. Annual Meet

ALTHOUGH the petroleum industry is but one among several represented in the highly regarded engineering society, it took a prominent role on the program of the annual meeting of the American Institute of Mining and Metallurgical Engineers at New York, February 17-20.

For the industry furnished the Institute its president for the coming year and took the spotlight at the elaborate banquet and reception at the Commodore Hotel Wednesday evening, when the incoming president was introduced and when one of several medals and honors of the Institute, the Anthony F. Lucas medal, was presented, in extraordinary circumstances, in memory of the man who drilled the original Spindletop gusher.

These special events were embodied in the program of the meeting in addition to the usual technical sessions, in which representatives of the oil industry participated for three days, and in addition to the customary annual dinner of the petroleum division.

Oil Man New President

Upon assuming the responsibilities of the presidency of the AIME for 1941, John R. Suman, of Houston, vice president and director of Humble Oil & Refining Company, went into a position that was filled in 1920 by a mining engineer who later became President of the United States—Herbert Hoover.

The post also has been held by other nationally prominent men, including George Otis Smith, whose career included service as director of the United States Geological Survey, and who was president of the Institute in 1928.

Other oil men who have been elevated to the presidency of the AIME in recent years have included John M. Lovejoy of New York, head of Seaboard Oil Company of Delaware, who served in 1936; and E. DeGolyer, geologist, geophysicist, and oil operator, formerly of New York and now of Dallas, who was president in 1927.

That the new president would give to his high position distinguished service was forecast at the New York meeting by men of the oil industry who knew the man and his record. And similar anticipation was voiced generally at the banquet, when the new head of the Institute justified earlier whispers that he was an accomplished toastmaster and speaker, a qualification that is expected to serve to advan-

The dinner smoker held in the Grand Ballroom of the Commodore Hotel on the evening of Monday, February 17, provided opportunity for gathering of alumni groups and meeting of business associates during the annual convention of the American Institute of Mining and Metallurgical Engineers in New York.

Herbert G. Moulton (left), outgoing president of the American Institute of Mining and Metallurgical Engineers, and John R. Suman, president of the Institute for 1941, photographed at the annual banquet in New York on the night of February 19, when Suman assumed office.

tage in visits with the local sections of the organization.

Suman was described by Herbert G. Moulton, retiring president and chairman and toastmaster at the annual banquet, as an ideal choice for new president. "He exemplifies all phases of engineering represented by the AIME," he said. "He has been a construction engineer, mining engineer, geologist, and prominent in the technical development of deep drilling of oil wells."

Moulton also humorously mentioned as a special qualification the fact that the new president should promote peace among Southern and Northern California engineers, because of having attended universities in both of those districts of that state.

The retiring president also took occasion to express gratitude to the numerous large corporations, as exemplified by Humble Oil & Refining Company, for giving generously the time of their employes and officials in the interest of the activities of the association.

After having been introduced as the president for 1941, Suman declared that he was long on short speeches at banquets. He proceeded to pledge himself to do all that he could to further the activities and interests of the Institute.

The remainder of his very brief speech was devoted to the subject of engineers and national defense. He called upon all engineers to do their part, "unreservedly and whole-heartedly," in the defense program.

"We must back the government 100 percent," he asserted. "If we do so, no nation on the face of the earth can ever subdue or subjugate us."

Although born in the small town of Daleville, Indiana (April 9, 1890), John Robert Suman migrated early to California, where he went to high school in Los Angeles, for two years to the University of Southern California, and for two years to the college of mining at the University of California, at Berkeley, where he was graduated with honors in 1912.

Following graduation, he went immediately into the oil business, having served Rio Bravo Oil Company of Houston, subsidiary of the Southern Pacific railroad, first as assistant geologist for one year and then as chief engineer from 1913 to 1917. In the two succeeding years he was technical superintendent of Texas and Louisiana operations for Roxana Petroleum Corporation. He then returned to Rio Bravo Oil Company and served as assistant to the vice president and general manager for six years, after which he himself assumed the latter titles. In 1927 he became connected with Humble Oil & Refining Company and was made a director, and in 1933 he became vice president of that company in charge of production, in which position he has materially aided in making the concern the largest oil producing unit of the Southwest.

Suman has written many technical articles in addition to his widely circulated book, *Petroleum Production Methods*. He is president of the Oil-World Exposition, Inc. (Houston Oil Show), and of the Houston Family Service Bureau; likes golf; and holds membership in the A.A.P.G., the A.P.I., the Mid-Continent Oil & Gas Association, the Institute of Petroleum, and the Houston Geological Society, of which he is a past president, in addition to the AIME, which he joined in 1917.

Institute Has 10,000 Members

As president of the AIME, Suman heads one of the four great national engineering societies of the United States. Organized in 1871, the Institute has as its object the promotion of the arts and sciences connected with the economic production of the useful minerals and metals and the welfare of those employed in those industries. It has 10,000 members, of whom one fourth live abroad, plus more than 3000 student associates. The Institute maintains six semi-autonomous technical divisions (Institute of Metals, Petroleum, Iron and Steel, Coal, Mineral Industry Education, and Industrial Minerals) and 14 technical committees, each of which watches progress in its own field and arranges for papers, discussions, and symposiums. Local sections are maintained in 33 districts. Each has its own officers, rules, funds, and programs. Delegates from each convene yearly at the annual meeting in New York, where headquarters are maintained; and the nominating committee for Institute officials is composed of representatives of these sections. In its efforts, the organization seeks to promote the general welfare of the whole industries represented in it, as well as the professional welfare of its members; and these aims are achieved through publication of journals and books and through the national and sectional meetings.

Lucas Medal Presented

The Anthony F. Lucas gold medal for 1941 was awarded to Conrad Schlumberger (who died in 1936) and his brother Marcel Schlumberger (who is in Paris); and the medal was received at the

AIME's annual banquet by Mrs. H. G. Doll of Houston, daughter of Conrad.

The medal is awarded in recognition of "distinguished achievement in improving the technique and practice of finding and producing petroleum," and the award for 1941 was made on recommendation of a special committee of 16 prominent men of the petroleum industry, headed by Joseph Jensen of Los Angeles, chief petroleum engineer for Tide Water Associated Oil Company. The medal was awarded to J. Edgar Pew in 1937, to Henry Latham Doherty in 1938, and to E. DeGolyer in 1940, and was not awarded in 1939.

Captain Anthony F. Lucas, in whose memory the fund for awarding the medal was established, was a pioneer of the oil industry, having discovered the Spindletop field at Beaumont, Texas, in 1901; and was one of the first petroleum engineers. For several years he served the AIME as chairman of the petroleum committee, the forerunner of the present petroleum division.

Provision has been made for use of income from the Anthony F. Lucas fund in excess of requirements for providing the medals for granting scholarships or otherwise promoting the welfare of the petroleum division, although the fund so far has been expanded only to moderate proportions.

The medal was awarded to the Schlumberger brothers "for development of the art of electrical coring or electrical logging. Electrical logging has proved of immense value in interpreting underground structure, locating faults, thereby assisting in the finding and production of oil. Utility of shotgun perforation, stage-cementing, and various other inventions are subsidiary to and dependent upon successful electrical coring."

Conrad Schlumberger was born October 2, 1878, at Guebwiller, Alsace, and with the object of becoming a French citizen, went to Paris at the age of 16. He was graduated from the Ecole Polytechnique in 1900, and after military training entered the Ecole Nationale Superieure des Mines, from which he was graduated in the mining corps in 1904. Subsequently, he was professor at the Ecole Nationale Superieure des Mines, of Saint Etienne and at the school of mines in Paris, where he began laboratory research about 1912 into distribution of electric currents in the earth. The work was interrupted by the war but was resumed in 1919, when he became associated with his younger brother Marcel, and soon he resigned at the school to devote all his time to the methods of electrically prospecting the subsoil. He died at Stockholm in 1936 while returning from an inspection trip in Russia.

Marcel Schlumberger was born at Guebwiller on June 21, 1884, and went at the age of 16 to Paris, where he received in 1907 an engineering degree from the Ecole Centrale des Arts et Manufactures. Of inventive mind, he became technical adviser to his father-in-law, who was interested in several mining companies; and after serving France in the war, he became associated with his brother. The brothers in 1921 established an office and shop at 30 Rue Fabert, which was maintained until the recent German invasion.

Their first commercial electrical prospecting survey, made in 1923, outlined an important producing field in Rumania, the Aricesti dome. Subsequently, surveys were made in 1924 and 1925 in Serbia, Canada, South Africa, Belgian Congo, and the United States.

H. G. Doll, husband of the daughter of Conrad Schlumberger who last week received the Lucas medal at New York, joined the Schlumberger firm in 1926 as an engineer; and after having contributed materially to the technical evolution of the various Schlumberger methods, is now technical manager of the Schlumberger Well Surveying Corporation at Houston.

Several companies have been organized in various parts of the world to exploit the various Schlumberger techniques.

Petroleum Division Program

The program of the petroleum division of the AIME commenced Tuesday morning, February 18, and both the morning and afternoon sessions of that day were de-

Group photographed during the presentation of awards in connection with the annual banquet of the American Institute of Mining and Metallurgical Engineers at the Hotel Commodore in New York, February 19. Herbert G. Moulton, retiring president, is presenting the Anthony F. Lucas gold medal for "distinguished achievement in improving the technique and practice of finding or producing petroleum" to Mrs. Henry G. Doll who is receiving it in behalf of her father, the late Conrad Schlumberger, and her uncle, Marcel Schlumberger, who is in France. Left to right: Herman C. Bellinger, vice president in charge of operations of the Chile Exploration Company, who received the William Lawrence Saunders gold medal "for his outstanding work in copper mining, as practiced in the development of the Chuquicamata Copper Mine, in Chile"; Mrs. Doll, Moulton and Robert Crooks Stanley, chairman of the board and president of The International Nickel Company of Canada, Ltd., who received the first Charles F. Rand gold medal for "distinguished achievement in the administration of the mining and metallurgical treatment of nickel and the expansion and diversification of world markets for nickel."

voted to reading and discussing 10 papers on production engineering subjects.

The sessions of Wednesday, February 19, were consumed in presentation of papers on foreign and domestic oil production, although reliable information on foreign operations was exceptionally limited, because of the wars.

Diversified economic papers held the attention of the division at both the morning and afternoon meetings Thursday, February 20.

Following the technical sessions, the program of the oil group was concluded with the petroleum division annual dinner in the Music Room of the Biltmore Hotel February 20, at which Eugene Holman, director of Standard Oil Company of New Jersey, made an after-dinner talk on "Petroleum Transportation in a World at War."

The annual dinner of the Petroleum Division furnished occasion also for introduction of the new chairman of the group for 1941. Dr. Eugene A. Stephenson, professor of petroleum engineering at the University of Kansas, had been chosen as chairman of the Petroleum Division for the coming year, and following Holman's talk, the office was turned over to him by T. V. Moore, of Houston, engineer for Humble Oil & Refining Company, who held the post during the past year.

At the speakers' table for the Petroleum Division dinner were, among others, the retiring president of the AIME, H. G. Moulton, George Otis Smith, former director of the United States Geological Survey and a former president of AIME, and E. DeGolyer, also a past president of the AIME, all of whom were called upon for short speeches.

Although there was only one associate chairman of the Petroleum Division during the past year, three men will serve in that capacity in 1941, R. B. Kelly, The Pure Oil Company, Olney, Illinois; V. C. Smith, Charleston, West Virginia, and H. P. Stolz, Stanley & Stolz, Los Angeles.

The executive committee of the division for 1941 will include Dr. Stephenson, chairman, C. J. Coberly, W. H. Geis, W. B. Heroy, D. R. Knowlton and T. V. Moore. The new secretary-treasurer of the group is Harold Vance, Texas A. & M. College, College Station, Texas, and Chester Naramore, New York, continues as executive secretary.

EUGENE A. STEPHENSON
Chairman, Petroleum Section, A.I.M.E.

Chairmen of standing committees of the division for 1941 have been announced as follows: Papers and Programs Committee, W. S. Morris, East Texas Engineering Association, Kilgore, Chairman, and L. E. Porter, Richfield Oil Corporation, Los Angeles, associate chairman; Production Engineering Committee, A. W. Walker, Stanolind Oil & Gas Company, Tulsa; Production Committee, J. Terry Duce, vice president, California Arabian Standard Oil Company, San Francisco, chairman, and M. T. Halbouty, consulting geologist and petroleum engineer, Houston, and Basil Zavoico, Chase National Bank, New York, associate chairmen; Economics Committee, L. F. Terry, Chase National Bank, New York; Engineering Research Committee, A. D. Garrison, Rice Institute, Houston; Refinery Engineering Committee, Walter Miller, Continental Oil Company, Ponca City; Membership Committee, C. A. Warner, Houston Oil Company of Texas, Houston, and Nominating Committee, H. H. Power, University of Texas, Austin.

Dr. Stephenson, new Petroleum Division chairman, was born at Franklin, Michigan, July 27, 1883, and was graduated from Adrian College, Michigan, with a B.S. degree in 1905. From 1914 to 1916, he was an instructor at the University of Chicago, and received his Ph. D. in 1915 from that university.

After serving as chief geologist for South Penn Oil Company at Pittsburgh from 1917 to 1925, he joined the staff of Ralph E. Davis, Inc., Pittsburgh, with which he remained until 1930. In that year, Dr. Stephenson was made professor of petroleum engineering at the University of Missouri, where he remained until 1938.

Economic Discussions Deal With Various Phases of European War Situation

The European war has materially affected the economics of the petroleum industry of the United States as well as the general economics of this country and the world, as brought out in some detail in papers on petroleum economics at the annual meeting of the American Institute of Mining and Metallurgical Engineers, which was held in New York February 17-20.

Various subjects related to the war were treated in the eight papers presented at the economics sessions of the petroleum division of the Institute in the morning and afternoon of Thursday, February 20; and another such subject was discussed in an after-dinner talk at the petroleum division dinner Thursday evening, when Eugene Holman, director, Standard Oil Company of New Jersey, read a prepared paper on "Petroleum Transportation in a World at War."

The effects of the war were reflected at the regular economics sessions in papers on "World Consumption of Petroleum" and "World Production of Petroleum Substitutes." And in addition to the reading of the latter paper, another on the same subject was offered for consideration of the group by B. Orchard Lisle, consulting petroleum technologist, of New York, who had prepared a discussion of Germany's position with regard to supplies of liquid fuel. Lisle was unable to attend the meeting because of illness, but his

[*Continued on page 60*]

Development of Shooting Practices For Multiple Zone Completions

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USE of removable windows or sections in the casing string to facilitate multi-sand completions in the Illinois Basin is well known. However, certain objectives have led to new methods of removal designed principally to reduce costs and permit more rapid pool development. The drilling program has been rapid, and some operators have desired to standardize on a completion method that permits movement of rotary tools from one location to another as soon as the oil string is set and cemented. A cable-tool spudder would then be moved in to drill the plugs, test the sands, and carry on the necessary steps for final completion. Since a great number of the new pools are multi-sand, removable windows frequently are placed in the oil string opposite the upper sands.

Removable windows are formed of sections of magnesium or aluminum-base-alloy pipe particularly suitable for the application. The magnesium-alloy casing is soluble in acids and to a certain extent in salt water, making its installation of a temporary nature. This type of window is removed by the circulation of inhibited acid and requires only some means of running tubing, which can be done with a spudder-type drilling machine. However, the aluminum-alloy window does not react satisfactorily to acid treatment for removal.[1] The original installations of the aluminum-alloy casing were of a reduced diameter and were removed with a pilot bit.[2] Later removable pipe of the same size as the casing was used and a wall scraper was employed to drill up the window section and expose the sand. The success of this method has induced many operators to continue the use of mechanical means for removal. However, as mentioned before, the time element was paramount with many operators, and experimental work was conducted on other methods of removal. Also, since the aluminum-alloy windows were used where it was felt that the installation would be in service for some length of time, it was desired to discover a method of removal that would not require the expense of moving in rotary tools to perform this function at a later date.

Reduced Diameter Sections

The first deviation from customary methods was the introduction of reduced interior diameter sections of the aluminum alloy to be drilled out with cable tools.[3] This restriction in internal diameters had some disadvantages, as the plug following the cement was necessarily stopped above the restriction and therefore, the method was discarded, due to the longer time involved for removal. The next method advanced was the destruction of a magnesium-alloy window by nitroglycerin. This method was suggested not because of dissatisfaction of the removal by acid, since acid removal had been highly successful,[4] but rather as a means of hastening the completion process. Most sands now producing in the Illinois Basin require a nitro shot to produce efficiently, and if the window could be removed as the sand was shot, a double purpose would be achieved and one step in the completion process eliminated with resultant savings.

Most of the operators had experienced trouble in previously developed areas when shooting steel casing as a means of exposing cased-off sands. It was felt that a similar method used with the lighter metals might cause a re-occurrence of the troubles they had experienced in the past. Steel casing usually ruptures sharply at the base of the tamp, and very little success is had in re-entering the casing below the point of rupture. If this were true of the lighter metals, the method would not be suitable since it is essential to re-enter the lower section of steel casing to efficiently produce both sands. Also, there was some doubt as to whether or not the metal would break up into pieces small enough to be removed from the hole by conventional means and whether the shot would injure the exposed ends of the steel casing at each end of the window.

In making the original test, the well was completed by the normal method in the lower zone. It was then plugged back to the base of the window with pea-gravel and a 40-quart shot of nitroglycerin positioned in the center of the window. The shot was tamped with 6 yards of pea-gravel and detonated by a 24-hour time clock. It was found that the window was shattered into particles about the size of a quarter, and that the fragments were easily removed by a sand pump. The steel casing was not injured, as heavy protective casing shoes were placed at each end of the window and no difficulty was encountered in re-entering the lower section of steel casing. Also, the force of the shot was sufficient to cause the sand to produce at a satisfactory rate, and considerable economy was achieved by the combination of removal and shooting in one operation.

Mechanical Plug

However, further development of this method led to certain alterations which reduced the cost and gave more satisfactory results. It was recognized that the

introduction of mud and gravel into the well for a plug-back after the lower zone was completed, was injurious to the producing qualities of the lower producing horizon. Therefore, some type of mechanical plug was desired to insert in the casing between the sands to prevent contamination of the lower sand and also to reduce the length of the plug-back required. One solution to this problem has been the use of a wooden plug with canvas or belting incorporated in its construction. This plug is inserted into the casing and forced down to the desired point by a cable-tool bit or some other heavy object. Another solution has been the development of a drillable bridging plug that could be introduced into the hole and set after the lower zone was completed. This bridging plug is run into the hole on a wire line and set, while the well is flowing or standing full of oil, thereby trapping only reservoir fluid below it. The bridging plug requires a double hook collar which is inserted in the casing string at the time it is run, so it will be positioned approximately 30 feet below the base of the upper sand. It may be run on the bottom of a regular dart bailer of a cable-tool stem. Special setting devices are provided to attach the plug to the run-in member. The bridging plug is designed to pass coupling recesses and will not set until the springs are engaged in the double-hook collar. Weight is applied downwardly by the run-in member and the packing element expanded. The setting equipment is removed by an upward movement which shears the pins holding the bridging plug to the run-in equipment. Plugging-back operations can be inaugurated at this point, reducing the length of plug and eliminating the detrimental effects of contamination upon the lower sand face.

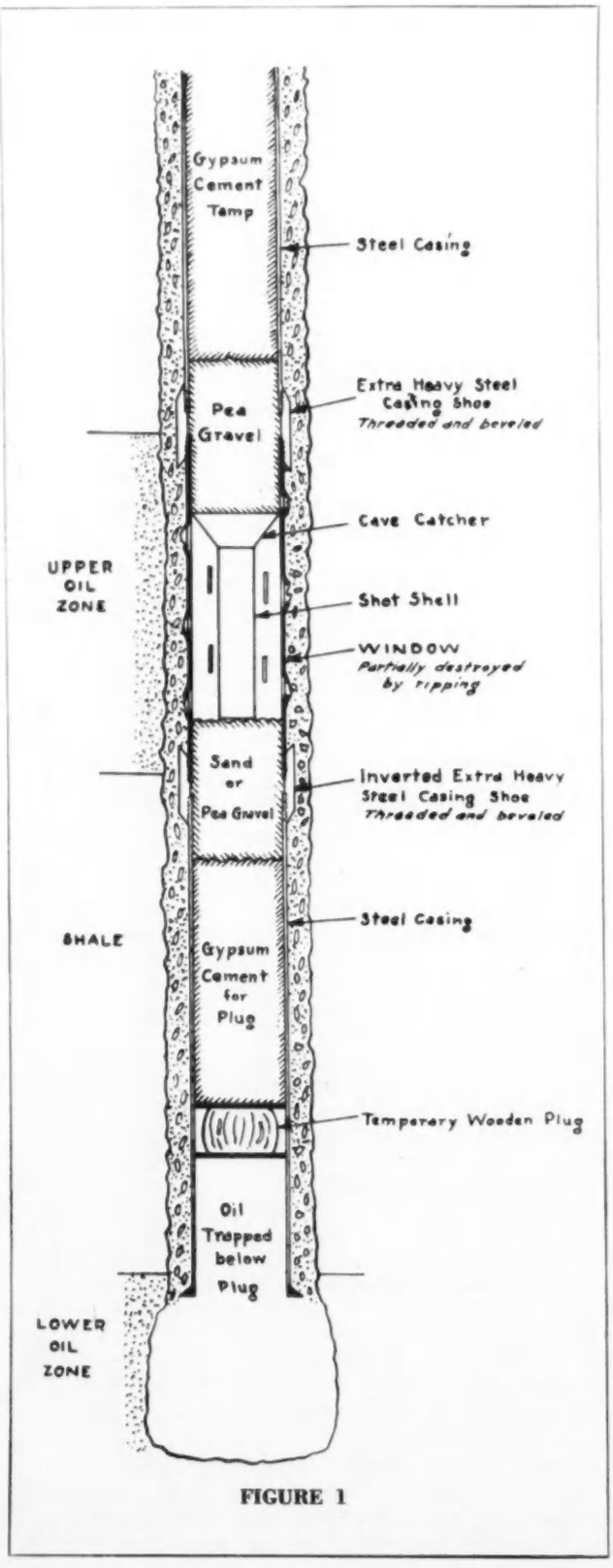

FIGURE 1

The bridging plug is removed by the force inflicted with several sharp blows delivered with a cable-tool bit which shears the pins holding the springs to the main body. The plug can then be drilled up or left in the bottom of the hole.

Although the bridging plug was designed originally for the method just explained, it has been found that it can be utilized for other purposes during the life of the well. Where it is desired to make a production test on the upper sand, a plug can be run and set in the collar to seal off the lower formation. It can be used also to plug off the lower sand when it is depleted in much the same fashion as it is used for plugging back.

Gypsum-Cement Tamps

The movement to shorten the length of the plug led to a further development in plugging back and tamping. A great amount of rig time was involved in placing long sand tamps and an equal amount of time consumed in removal. The original procedure in tamping was to use the conventional sand tamp of approximately 4 to 6 yards. The time required to place this tamp was sufficient to force the operator to use a 24-hour bomb. Approximately 2 hours of waiting time after the shot detonation was required for the sand to settle, and an additional day and a half was needed to remove the tamp and clean the hole. In light of the time required for this method, gypsum cement was used for plugging back and tamping as its placement could be made with a minimum of time and time clocks having a shorter period of time could be utilized. The gypsum-cement is positioned by special-constructed drillable bailers, and its setting time can be regulated to meet any requirement. More effective results were obtained by the use of the gypsum-cement tamps, and contrary to expectations, the tamp usually is found rigidly in place after the shot. This, then, leads to the belief that more effective force of the shot is directed to the desired point than formerly obtained with the sand tamp. It also is claimed that a reduction of

damaged casing results from the use of the gypsum-cement tamp. Considerably less time is required to place and remove this type of plug-back and tamp with resultant gain in rig time. Also, a small economy is obtained by the use of time clocks having a shorter setting period.

It was found that better results were obtained in removing the windows by concentrating the shot near the center of the section. This led to the use of the solidified nitroglycerin to permit dumping the shot and concentrating it at one spot. Those operators still expressing preference for the liquid shot, used as large a shot shell as possible to obtain the same results. No outstanding benefits from either type have been noted, which would establish one method more beneficial than the other. Various operators express preference for both types, with the principal factor being the concentration of the shot in as short a distance as possible.

To provide against the destruction of the ends of the steel casing, extra heavy steel Texas pattern casing shoes were fabricated carrying internal threads to accommodate the window and having a beveled edge on the exposed end.[5] The shoes are made up in the string so the beveled edges face each other and provide a guide for the clean-out tools and tubing that will be run into the hole at a later date. Furthermore, where the installations were made of a permanent nature, the shoes are cadmium plated as a precaution against electrolysis.

Removal of magnesium-alloy windows by shooting was in existence for some time before the practice was adapted to the aluminum-alloy windows.[6] The reason for this delay was due to the fact that the physical properties of the aluminum alloy more closely approached those of steel and some fear was expressed that the results obtained would have the same undesired results as shooting steel casing. However, the method was tried and found to be equally as successful with the aluminum alloy as had been experienced with the magnesium alloy. The only notable difference was that the shattered pieces of the aluminum alloy were somewhat larger than those obtained by shooting the magnesium alloy, yet enough difference did not result to impede their removal.

Three methods of removal by shooting are being used. Apparently each method is accomplishing the desired purpose satisfactorily with individual operators expressing preference for each method.

Method 1—Ripping the Window with a Cable Tool Ripper Prior to Shooting

This method is based on the original test and is still in use by some operators (Figure 1). In the beginning it was felt that ripping the window with a cable-tool ripper would weaken the metal's resistance. The shot then would more easily shatter the metal into small fragments which could be removed from the hole with a bailer or sand pump. After the well has been completed in the lower zone, a wooden plug is inserted in the casing approximately 30 feet below the base of the window, and the well is plugged back with gypsum cement or pea gravel to a point just below the section to be removed. If a gypsum-cement plug-back is used, it is terminated several feet below the window and pea gravel or sand placed upon it to a point 3 or 4 feet up into the window. The purpose of this procedure is to have a portion of the plug-back suitable for removal by other means than drilling. It was pointed out that if gypsum cement was placed up to the base of the window, the cable-tool bit would have difficulty in gaining entrance into the lower steel section and might possibly sidetrack this part of the cased hole. The vertical movement of the drill bit at this point might also batter the shoe to such an extent that future passage

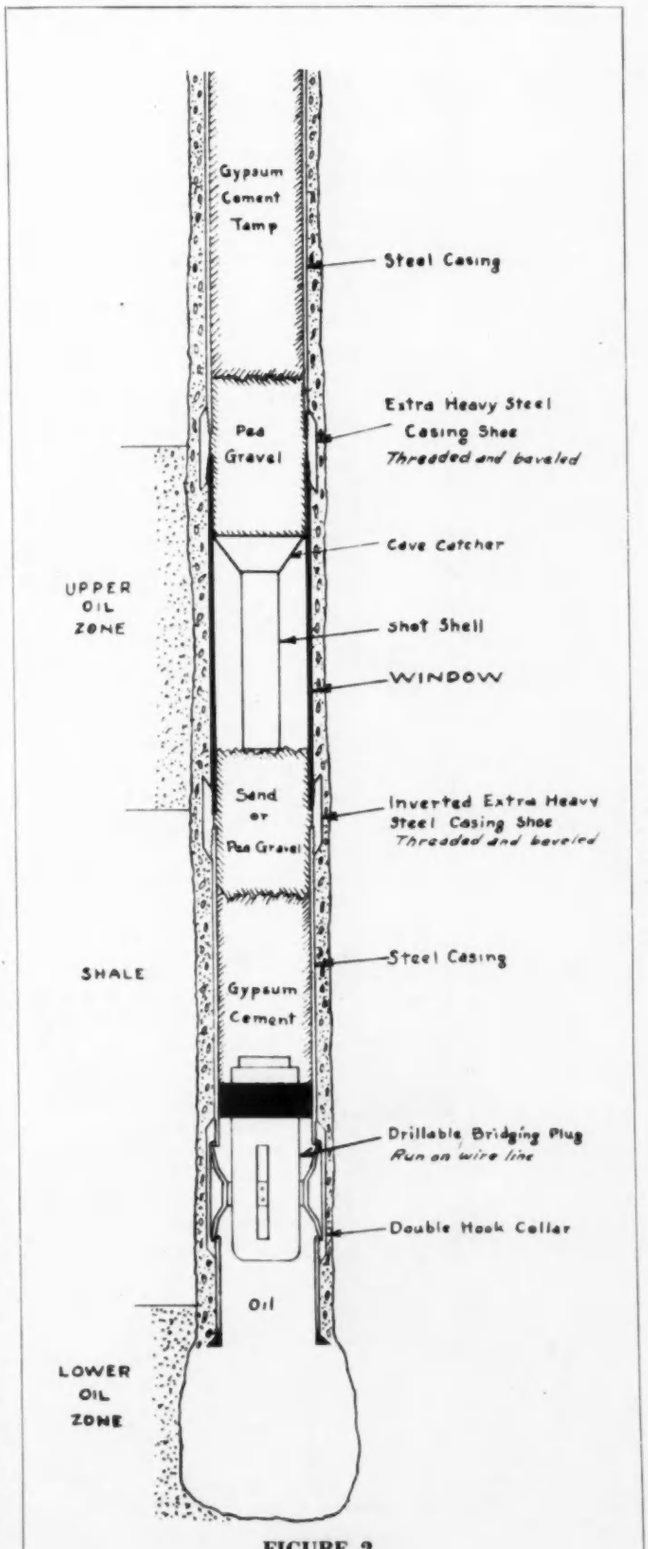

FIGURE 2

through it would be impeded. Then, too, there was the possibility of a misdirected blow on the shoe having sufficient intensity to loosen the lower steel section from its cement bond and permit it to drop in the hole, opening unwanted shale horizons and covering up the lower pay. With the cement plug terminated several feet below the shoe, a sufficient distance is provided for the movement of the cable tools during their stroke so that at no time will they ever be raised to a height that would permit the bit to swing free in the open hole. This eliminates any damage to the top portion of the lower steel section.

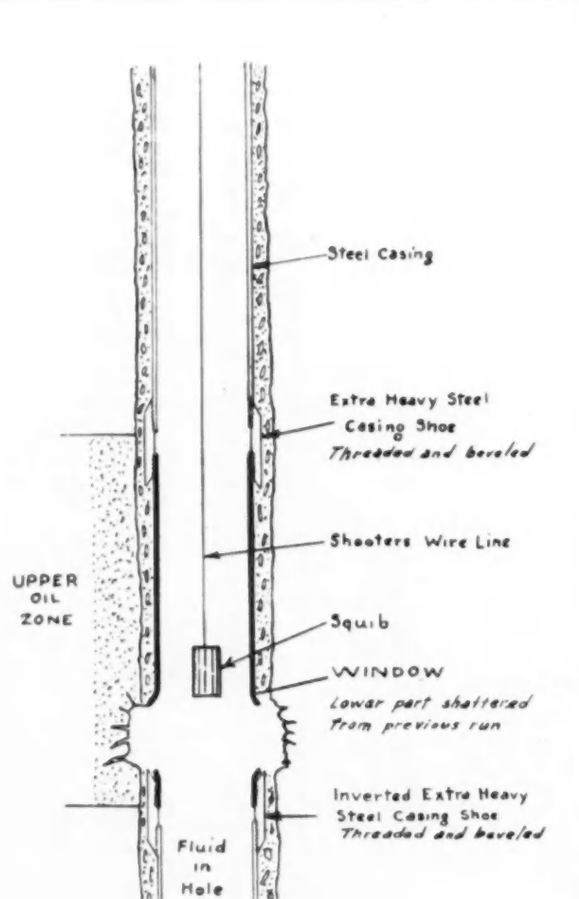

FIGURE 3

The section to be removed is then ripped with a cable-tool ripper, and the shot is lowered into the hole with the maximum concentration being at the center of the window. A typical average shot for a 20-foot window consists of 20 quarts of solidified and 10 quarts of liquid nitroglycerin, combining the two types of explosives to gain a concentration of material. The top of the shot shell is provided with an umbrella or cave catcher which is usually 5 feet or more below the top of the window. Pea gravel is placed on the umbrella to a point above the upper shoe, and the remaining 40 or 50 feet of the tamp consists of gypsum cement. Time clocks set for varying lengths of time are used, the tendency being to use the time clocks covering the shorter periods to benefit by the lesser costs.

After the shot is detonated, the hole is entered with a cable-tool bit, and the gypsum-cement tamp is removed by drilling. A sand pump is then used to remove the gravel, broken metal fragments, cement from around the window and to clean up the hole. Upon completion of the cleaning-out process, the upper sand usually is tested with the lower plug still in place. After a production test on the upper sand, the lower cement plug is drilled out, the wooden plug driven to bottom, and the well completed as a multi-sand producer.

Listed below is a tabulation of material required for the removal of a window by this method and the average cost, which includes the shooting of the sand preparatory to production which would be required if some other method of removal were used.

Cable-tool ripper (rental)	1 day
Nitroglycerin	30-40 quarts
Pea gravel	2 yards
Gypsum cement	5 sacks
Special bailer & mixer for gypsum cement (rental)	
Time clock (12-hour or less)	1
Cave catcher	1
Total average cost	$350.00

Rig time for the above complete process varies from three to four days and is not included in the total cost, as rates vary in different localities.

Method 2—Bridging Above and Below a Window That Has Not Been Ripped

Some operators felt that ripping the window was permitting some of the force of the shot to be lost, and the full effects of the shot were not directed entirely on the window, which was desired. Therefore, the same procedure was followed as formerly with the exception of the ripping, which was eliminated. This method in many cases appeared to give better results. One operator, standardizing on this method exclusively, uses the following procedure, which has been accepted by many others. A double-hook collar is placed in the casing string about 30 feet below the window as shown in Figure 2. A wire-line drillable bridging plug is then run and positioned in the hook collar after the lower zone is completed. The rest of the operations are similar to Method 1. Some operators advocate stage shooting to obtain best results, removing the window with a light shot, cleaning out and testing with the bottom plug in place and then shooting with a heavier charge. This variation is usually resorted to in unusually tightly

TABLE 1

POOL	Number of Operators Using Each Method		
	Method 1	Method 2	Method 3
Griffin	2	1	....
Mill Shoals	1	1	....
Fairfield	1	....	....
Loudon	....	1	....
Heusler Dome	....	1	....
Keensburg	....	2	....
Mt. Carmel	....	1	....
Calvin	....	....	3
Posey County, Indiana	....	....	1
Phillipstown	....	....	1
Total	4	7	5

cemented sands, or where the results of the first shot do not give the desired results.

This method has found favor with many operators as the use of the drillable bridging plug permits greater flexibility in workovers and testing in future operations.

Listed below is a tabulation of the material required for this method with an approximate cost based on the average of several removals:

Double-hook collar	1
Wire-line drillable bridging plug	1
Nitroglycerin	30-40 quarts
Pea gravel	2 yards
Special bailer & mixer for gypsum cement	
Gypsum cement	5 sacks
Time clock	1
Cave catcher	1
Total average cost	$400.00

Rig time for this method is slightly less than Method 1, the difference being roughly the time required to rip the window.

Method 3—Shooting with Squibs

This method is probably being used more extensively than either of the other two. This type of removal is by far the least expensive and has gained favor among the operators from that angle. No plug-back or tamp is used, which obviously reduces the amount of rig time required. Some operators do insert the double-hook collar in the casing string and employ the drillable bridging plug as an agent to catch and trap the cement and metal fragments resulting from the shot. Also, if the original shot was not of sufficient intensity, the plug is already inserted for the plugging-back operations for the additional shot. Although the superiority of the solid tamp over liquid stemming has been recognized,[7] results obtained with liquid only as a stemming agent have given satisfactory results for this type of work.

A 16-inch squib containing ¾ of a quart of liquid nitroglycerin is lowered into the hole on the shooter's wire line to a point just above the bottom of the window. A three-ounce weight is then dropped on the wire line, which detonates the shot. The wire line is then removed and the process repeated 16 inches higher than the first shot (Figure 3). This procedure is repeated until the window is removed. Where a bridging plug has been placed in the lower steel section, the particles resulting from the shot are trapped and removed from the hole with a sand pump. If this method of shooting does not cause the sand to react as expected, the formation is reshot similar to Method 2, utilizing the bridging plug as a base for the plug back.

Material and average costs for this method, provided that reshooting is not necessary, is as follows:

Double-hook collar	1
Drillable bridging plug	1
Nitro (20-foot window)	15 quarts
Total average cost	$190.00

Due to the elimination of plugging back and tamping, rig time for this method is less than the previous methods described. Average time is approximately two days.

A typical example of removal by Method 3 is best shown by the following illustration. One company removed 20 feet of 7-inch O.D. aluminum-alloy casing in six tours. This not only included the removal of the window by squib shooting, but included the time necessary to place an additional shot to reshoot the sand. A drillable bridging plug was placed in the casing prior to the squib removal, which partially accounts for the rapidity of the removal.

The accompanying photograph (Figure 4) illustrates the form of metal fragments obtained by this method, and it can readily be noted that particles of this size would offer no resistance to removal by

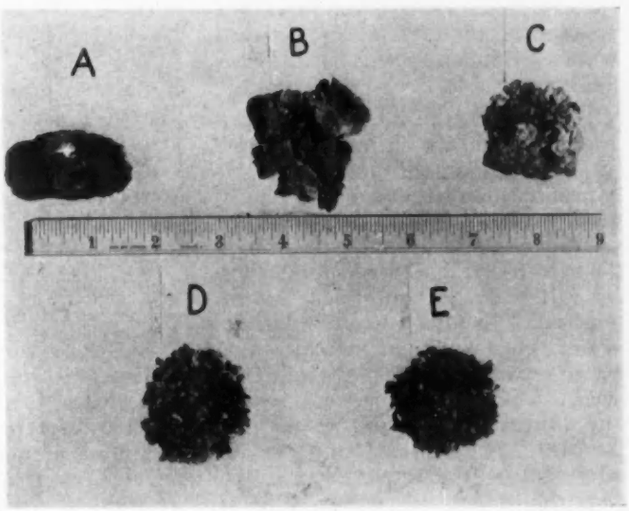

FIGURE 4

conventional means. A, B and C are illustrations of the fragments obtained just after entering the window section after the shot. C and D are samples removed from within the lower section of steel casing and illustrate how the larger chips are reduced in size by drilling with a cable-tool bit.

Table 1 illustrates the widespread use in Illinois of the three methods of removal. Although the table shows that preference for Method 2 is expressed by operators, this cannot be taken to be a true picture, as Method 3 has only been in use a relatively short time and more operators are switching from Methods 1 and 2 to Method 3 as future removals occur.

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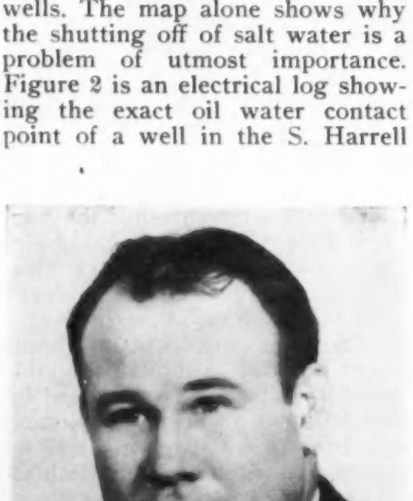
Developments in Plug Back Work in East Texas

By W. H. WIGINTON
The Atlantic Refining Company

Abstracted from a paper entitled "Recent Trends and Success of Plug Back Work in East Texas" presented before the East Texas Chapter of American Petroleum Institute's Division of Production at Kilgore, Texas, February 18, 1941. The original paper included 4 tables showing costs of various methods, the approximate number and success of various types of jobs, the trend of operators' opinions on various methods and the trend in 1940 towards high-pressure squeeze cementing, which have been deleted from the attached discussion.

As the daily water production is increasing steadily, much discussion is being carried on as to the economics of controlling the salt water produced in the East Texas field.

A sketch of the East Texas field, Figure 1, shows minus 3320 line on base of Woodbine sand. It is estimated that the original water level was minus 3320 and that portion of the field west of the minus 3320 line originally was underlain by salt water. The shaded area in Figure 1 shows where serious water encroachment already has been encountered in producing wells. The map alone shows why the shutting off of salt water is a problem of utmost importance. Figure 2 is an electrical log showing the exact oil water contact point of a well in the S. Harrell Survey in Upshur County. Logs of this nature are needed to furnish data to operators as to the water level of the field.



W. H. WIGINTON

The purpose of this paper is to discuss briefly the older methods and give a more complete discussion of the newer methods used in plug back work to shut off salt water, showing past results of various methods that have been employed and outlining the economics of this type of remedial work.

Older Methods

The cost of a majority of the work-overs in the past has been entirely too high to justify the work; therefore, the various operators have demanded that less expensive methods be developed whereby salt water production can be profitably curtailed.

The older methods in use are:

1. Dump Bailer
2. Displacement
3. Bradenhead Squeeze
4. Short String Squeeze
5. Retainer Squeeze

Note: Any type tool that retains pressure on the formation while the cement is setting is hereinafter referred to as "retainer".

1. Dump Bailer Method

This method is one of the oldest in use in plug back work. The required amount of cement slurry is mixed by hand and placed in the bailer. The bailer is lowered to the bottom of the well on a sand line. The bottom of the bailer is opened mechanically through a trip assembly after total depth of the hole is reached, thus the cement is discharged. The procedure is repeated until a predetermined point, obtained from a driller's log or an electrical log, is reached. After a period necessary for the cement to set has elapsed, the well may be tested. Several successful plug back

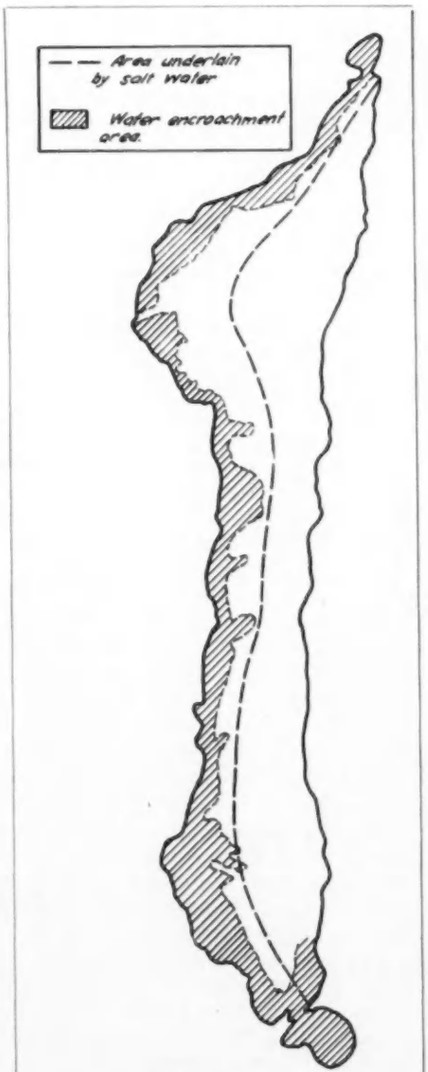


FIGURE 1
Serious water encroachment area and original area underlain by salt water, East Texas field.

jobs have been done by this method—mainly in wells making a small percentage of salt water, and immediately after the water entered the bore of the well. The shutoff of salt water by this method is shown to have less permanence than other methods in use.

2. Displacement Method

If the cement plug is cut off below the top of the oil sand by this method, it is necessary to know definitely where the top of oil sand is located, which is obtained from the core record or electrical log. The tubing is placed a few inches off of bottom of the well. The cement is mixed and pumped into the tubing. This cement slurry is followed up with a measured amount of fluid necessary to equalize the cement in the bottom of the well. The tubing is then raised and the cement plug is cut off at the desired point below the top of the oil sand, washing the excess cement out of the well. Usually the tubing is raised to a point in the casing, and after the cement plug has set, the tubing is placed near bottom and the well swabbed in.

This same method can be used where the top of the cement plug is cut off up in the casing. After the setting time has elapsed, the well is drilled in, preferably with cable tools. Where a well is completed originally through perforations and later water enters the casing of the well through the perforated zone, it is possible to place a cement plug in and above the perforations by this method. In some parts of the field the column of water above the cement plug exerts enough hydrostatic pressure to force the cement into the formation, therefore making this type of job a complete failure.

3. Braden-Head Squeeze Method

On this type job, where the top of the cement plug is cut off below the top of the oil sand, it also is necessary to know the exact depth of the top of the oil sand. The cement is mixed and equalized, and the excess cement is washed out, in the same manner as in the displacement method. The tubing is raised in the casing and pressure from 500 to 1000 pounds per square inch is placed on the well. With the well closed in, this allows the cement to set under pressure.

If the top of the cement plug is cut off up in the casing, the following procedure is used: An amount of cement is run and equalized in the bottom of the well to fill up from the total depth of the well to usually 100 feet up in the casing. The bottom of the tubing is raised approximately 60 feet up in the casing and the cement above this point is washed out. The casing is closed in, and by a measurement of the fluid pumped, it is possible to determine how much cement is being placed in the formation and where the top of the plug should be at all times. Usually from 10 to 20 feet of cement is left in the bottom of the casing when the squeezing ceases. The casing is closed in and the cement sets under pressure. The well is drilled in with cable tools after the setting time has elapsed. It is possible to shut off salt water that has entered a well through perforations by this method.

The cement may continue to move into the formation after the squeezing has ceased, because of the pressure exerted by the column of fluid, resulting in an unsuccessful job. There is a possibility of damaging the light weight casing that is in use in this field by applying the pressure necessary in some instances to place the cement into the formation.

4. Short String Squeeze Method

This method is used where a well has a large amount of open hole, to cement off a caving formation, or where the operator desires to drill the well deeper.

If the well is drilled deeper, the following procedure is used: Drill pipe and mud preferably are used. After the amount of desired hole is drilled, an electrical log is run to locate the shale breaks and the oil-water contact. The hole is underreamed, if the operator elects, from the casing seat to a point approximately 10 feet from the bottom of the hole. This leaves a rat hole, thus keeping the liner away from the walls of the hole at the oil-water contact point. The insert-

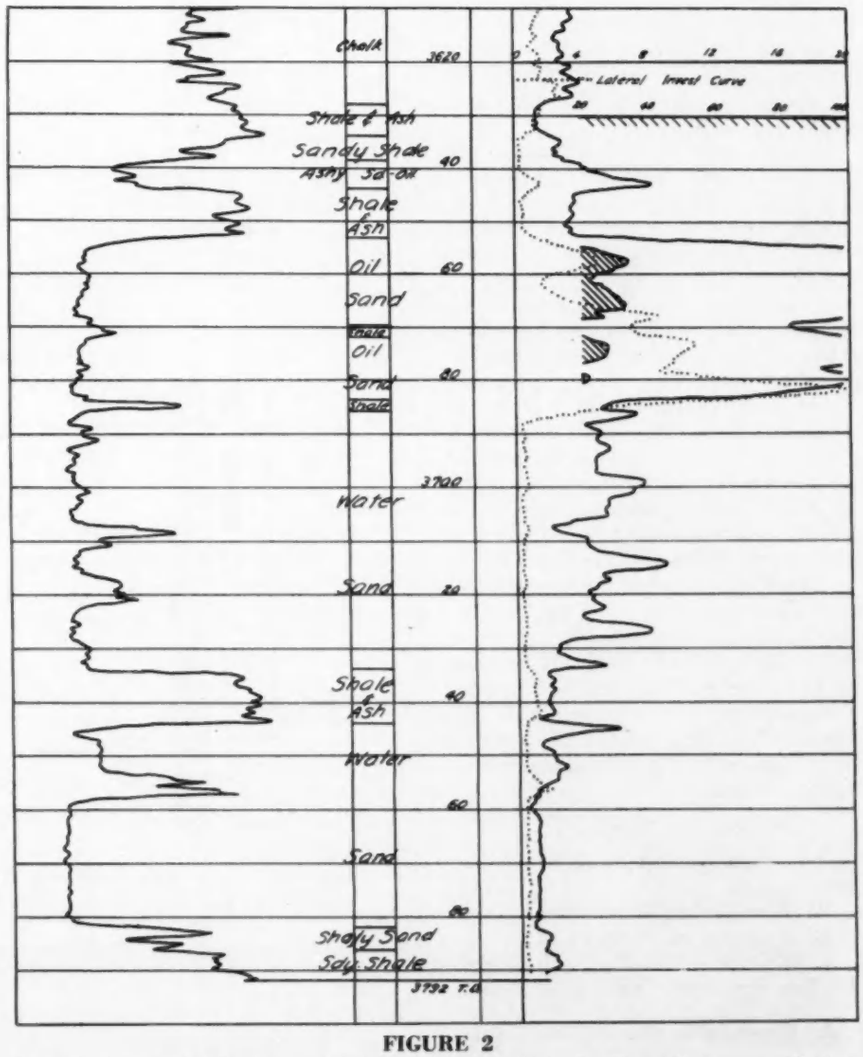


FIGURE 2

Electrical log of Woodbine formation of a well in S. Harrell Survey, Upshur County, East Texas field.

ed liner, having anchor shoe with back pressure valve on the bottom and packer assembly with hold down slips on top is run to the bottom of the hole on either tubing or drill pipe. Cement is then pumped through the lowering in string. After unscrewing from the setting tool, the packer is collapsed by allowing the weight of the drill pipe or tubing to rest upon it. This also sets the slips which prevent the liner from moving up the hole while pressure is applied. The cement is squeezed into the formation with no pressure on the casing. When the back pressure valve closes, the wash pipe is lifted up and the excess cement is washed out. The liner is then perforated and the well swabbed in.

5. Retainer Squeeze Method

A cement retainer consists of a packing element with upper and lower slips and a back pressure valve, all constructed of drillable material. The retainer is connected to tubing or drill pipe with a circulating joint. The circulating joint is connected to the retainer with left-handed threads. After the retainer is set, the formation is "broken down" by pumping 10 to 20 barrels of water into the formation. A 14- to 16-pound cement slurry is mixed and pumped into the formation. When the desired amount of cement is placed in the formation, the circulating joint is backed off in the left-hand threads, the excess cement is washed out, and the circulating joint and tubing or drill pipe are removed from the well. The back pressure valve allows the cement to set under pressure. If the back pressure valve fails to close, in most instances only a small amount of cement flows back.

The types of plug back work being done with the use of the retainer are: squeezing formation in open hole, with or without the use of tail pipe, squeezing through perforations or where a full hole cementer has been used and used as a bridge plug between two perforated zones.

Recent Methods

The more recent methods in use are:

A. Removable Cementing Tool.
B. Formation Packers.
C. Bridge Plug or Hookwall Packer Between Perforated Zones.

A. Removable Cementing Tool

A new removable cementing tool offered by several service companies consists of cups and slips with a by-pass joint on top of the tool. Upon application of hydraulic pressure the cups expand, thereby keeping the pressure off the casing. The slips are necessary to hold the tool and tubing or drill pipe in the hole while the pressure is on the formation. After the required amount of cement is placed in the formation, the tool is released, the excess cement is washed out by reverse circulation, and pulled out of the well. No appreciable amount of cement returns after the tool is released if the final pressure obtained is from 1800 to 3000 pounds per square inch on the pump. Figure 3 shows one of the removable cementing tools used in the field.

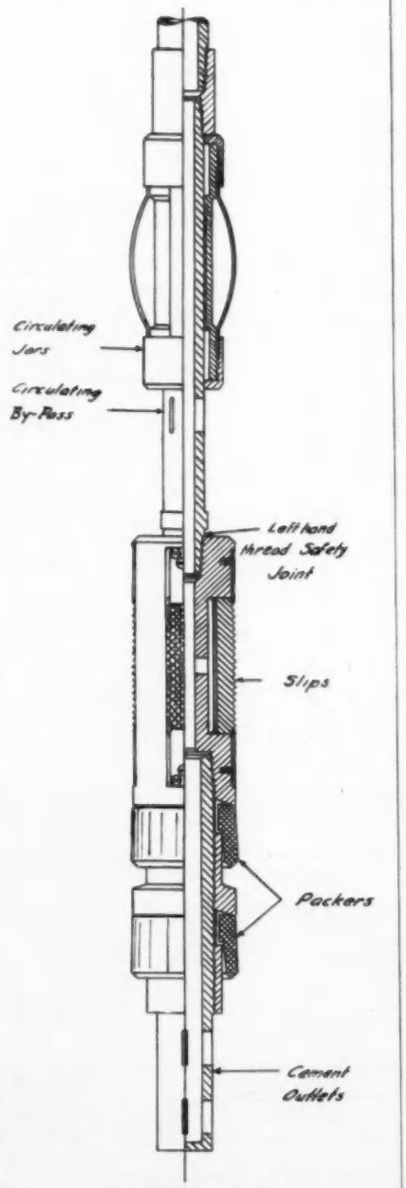


FIGURE 3
Removable Cementing Tool

The common practice of operators in the field in high pressure squeeze jobs is to mix 250 sacks of cement for open hole squeezing and from 25 to 50 sacks for squeezing through perforations.

Formation in open hole may be squeezed with the tool set in the casing and if desirable, when the formation has caved, tail pipe can be used. Thus far, it has not been proven if the cement plug can be cut off below the top of the oil sand and the well swabbed in without some necessary drilling.

Squeezing the formation through perforations to shut-off bottom hole water or fresh water can be accomplished with the tool. After the pressure is applied and the tool released, all excess cement is washed out of the casing by reversing the circulation. This procedure eliminates the necessity of drilling out the cement plug. Also, the tool can be used to wash behind perforations. By the use of a removable tool, it is possible to squeeze a formation through a perforated zone and produce from the top of the same zone without drilling or reperforating.

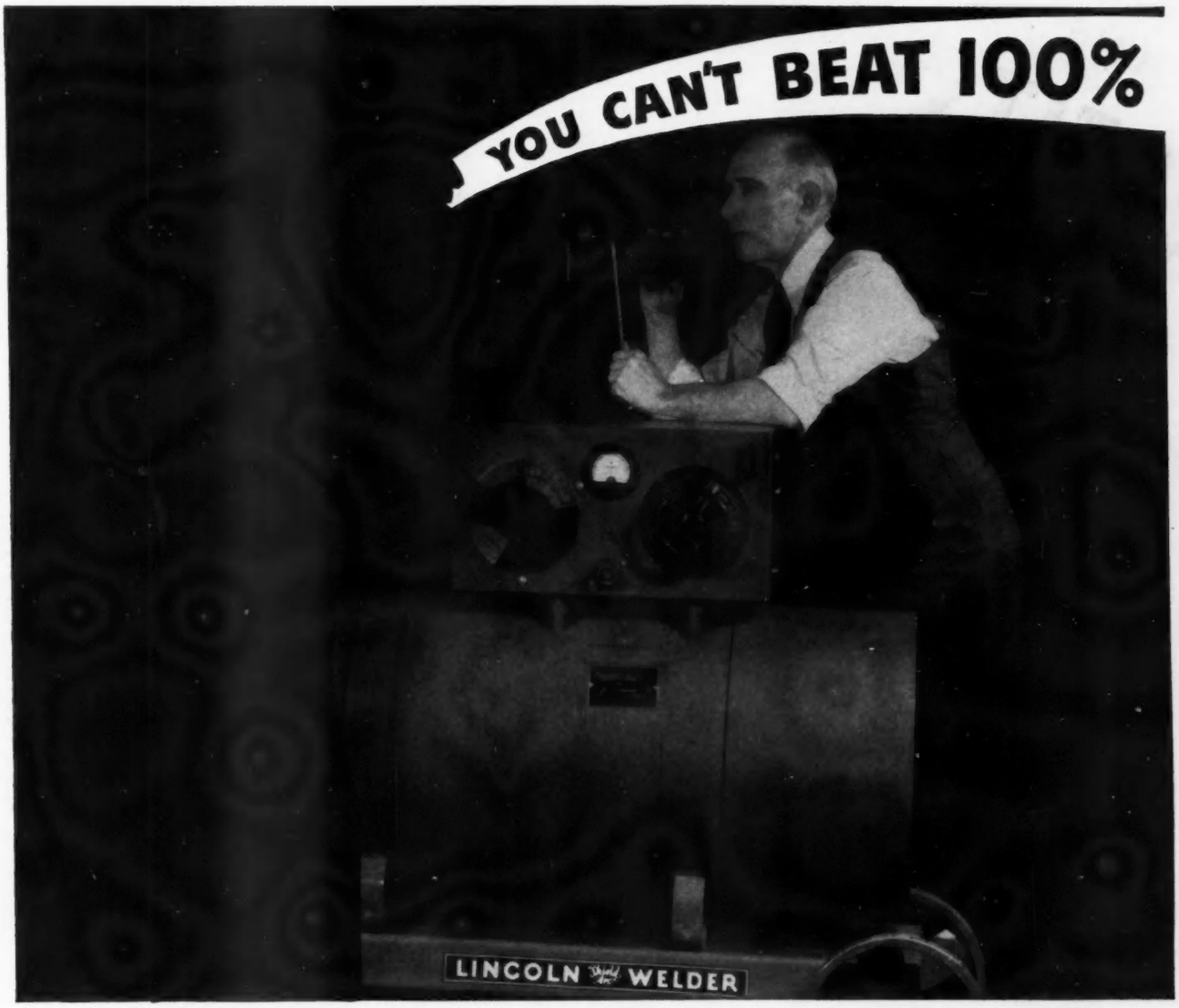
If measurements are incorrect, the tool can be reset indefinitely until the correct location is decided upon.

The first plug back job that was done with this tool was on July 12, 1940. Up to January 25, 1941, 34 squeeze jobs to shut off salt water and 12 jobs to test pipe and shut off fresh water had been completed. One operator has completed eight jobs to retard salt water with the tool, with all the jobs being 100 percent successful.

The opinion of some operators is that the cement plug cracks when the well is drilled in with cable tools after a high pressure squeeze job, either using a retainer or a removable cementing tool. The results of thirty-eight jobs which were studied show the above thought to be untrue. In thirty-seven of the jobs the tools sidetracked the original hole. A depth of 12 feet was drilled below 5½-inch casing in a 9⅞-inch hole in the other well without leaving the original hole. It was necessary to perforate a zone at the bottom of the casing to bring the well in.

B. Formation Packer

A formation packer has been developed to provide an adjustable and removable pack-off between an upper and lower producing formation, where it may be impossible to



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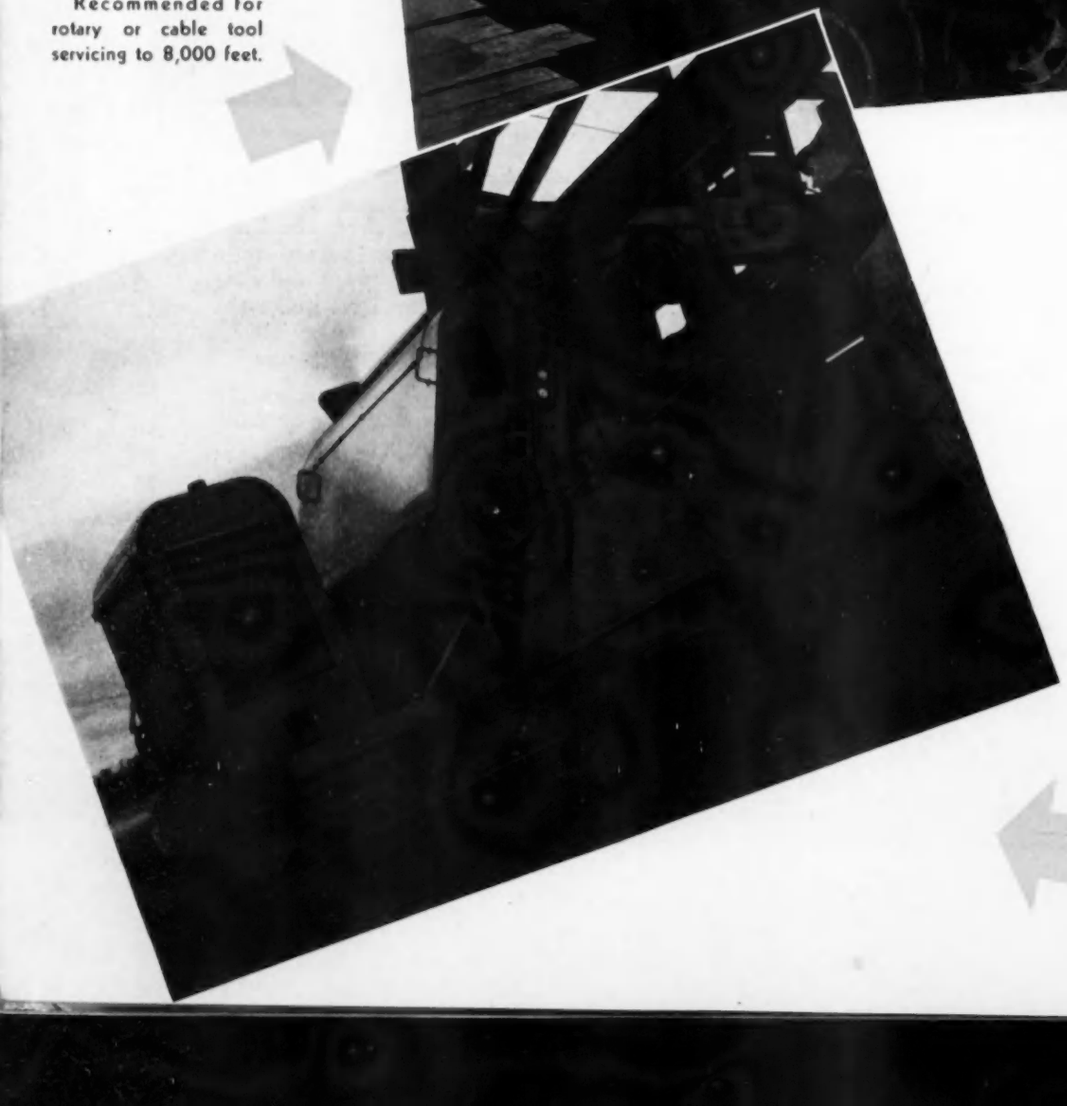

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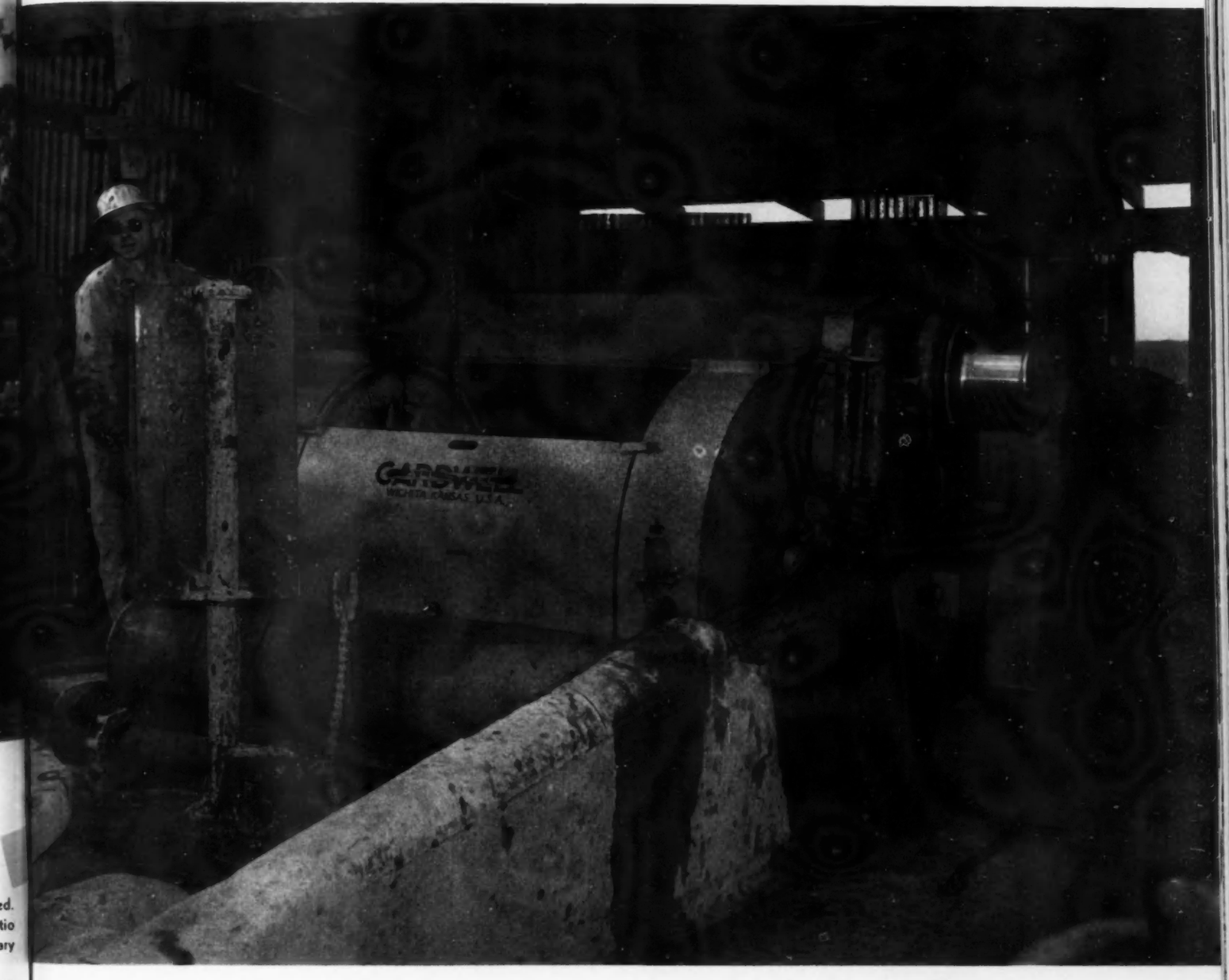

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predetermine exactly the most effective pack-off point. Some of the factors affecting the most desirable location of the packer which may be difficult and expensive to determine, are:

The absence or presence of a definite shale break and its definite location.

The size of hole below the casing seat.

The condition of the well bore in regard to caves, washes, etc.

By means of the formation packer, the pack-off point can be adjusted to give the most effective shut-off.

Should the packing elements be injured while being lowered in the hole, or if sloughing has occurred so that the tool can not reach the desired depth, the packer can be removed from the hole either before or after testing.

Figure 4 shows a sketch of a formation packer which has been used in the field to shut off salt water.

A formation packer of the hook-wall type recently used consists of a hanger assembly that includes a mandrel and slips which are set in the casing, a lower packing assembly consisting of neoprene elements, three elements each 16 inches long usually being used; and a lower stuffing box assembly which allows movement of the pipe running through the packing assembly for setting the packer. The two sections are joined together and spaced apart by spacer pipe (usually 4-inch line pipe, where there is 7-inch casing in the well). It is necessary to perforate the spacer pipe and install a perforated nipple in the tubing string to allow fluid passage. A minimum of 12 feet of hole below the casing is necessary to efficiently complete the setting of this formation packer. A 6¼-inch hole below 7-inch casing is an ideal condition for this method of remedial work.

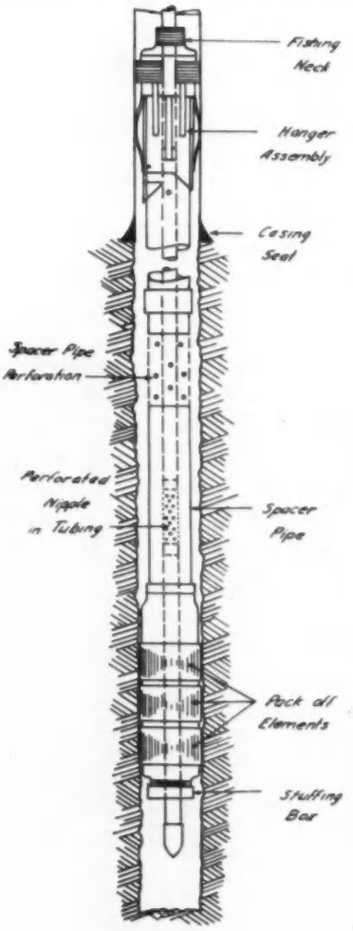

FIGURE 4
Formation Packer

These packers have been set in formation where the electrical log showed no shale break and a complete water shut-off obtained. By the addition of a second stuffing box in the spacer pipe and a pack-off element on the hanger assembly, one operator shut off a casing leak and bottom hole water in one of his wells.

Figure 5 shows an electrical log and sketch of the location of a formation packer used to shut off salt water in a well in the F. Cordova Survey in Rusk County. The well had been pumping for approximately two years and producing 70 percent B.S. & W. The formation packer was set on June 11, 1940, and the pump and rods were left out of the well. The well is flowing and continues to produce pipe line oil.

A formation packer was set on February 24, 1940, in a well in the Cordova Survey. The well was producing 40 percent B.S. & W., and at the present continues to produce pipe line oil.

Approximately 25 formation packers have been set in the field, 20 being successful in shutting off salt water. One operator has set 10 of the packers with eight of the jobs resulting in a complete shut-off of salt water. On the two jobs that were failures, an attempt was made to re-set the formation packers at a higher point. When the packers were removed from the well, the pack-off elements were torn off of the mandrels and found to be in the bore of the well where

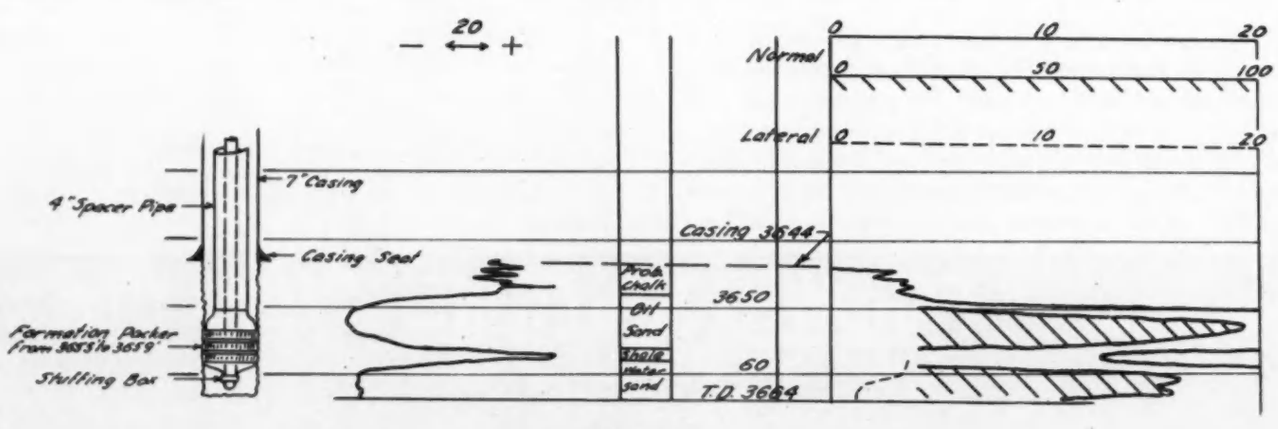

FIGURE 5
Electrical log and location of formation packer. Well in the Cordova Survey, Rusk County, East Texas field.

the first attempt was made to set them. It was necessary to use a hydrostatic bailer with junk catcher attached, to recover the torn elements from the well. The water was later shut off in these wells, using a removable cementing tool to place the cement in the formation.

C. Bridge Plugs or Hookwall Packers Between Perforated Zones

This method is used where the oil string is set through the sand section and the original completion of the well is through perforations. After water starts to enter the well, a higher zone is perforated and some type of bridging plug or hookwall packer set between the two perforated zones.

Figure 6 shows an electrical log and location of hookwall packer in a well in the R. W. Smith Survey in Rusk County. The hookwall packer was installed in the well in June, 1938, and the well continues to produce pipe line oil. The presence of a major shale break increases the chances of a successful shut off of the salt water.

A complete shut off should be obtained, after the installation of a plug between two perforated zones, provided the original cement job prevents the water from channeling behind the casing. In the event of several perforated zones, the use of the hookwall packer allows the operator to determine the exact point of water encroachment.

From an economical standpoint, the use of the hookwall packer with bottom plugged and a perforated nipple placed above the packer is desirable, as the packer may be removed and used again; therefore, the casing is free from obstructions.

One operator in the field has attempted several jobs to retard salt water by the chemical plug method. One of the jobs obtained a complete shut off of the salt water, while another one was partly successful. It is estimated that the chemical was forced as far as twenty feet into the formation. Much study is being given to this method, and may prove to be effective in the future.

Several months ago one operator plugged back a well by the short string squeeze method, with an added feature of metal baskets expanding against the formation to retard the upward and downward pressure. The well continues to produce pipe line oil.

Investigations disclose that the operators who plugged back immediately after water entered a well, thereby preventing the sand section from becoming contaminated, obtained more permanent shut-offs, also a greater percentage of success.

The plug back method to be used should be governed by the manner of original completion and by local sand conditions in the well.

The major considerations in deciding on remedial work in the field, are:

1. Location of the well,
2. Amount of oil-bearing sand, free of water,
3. Percentage of, and length

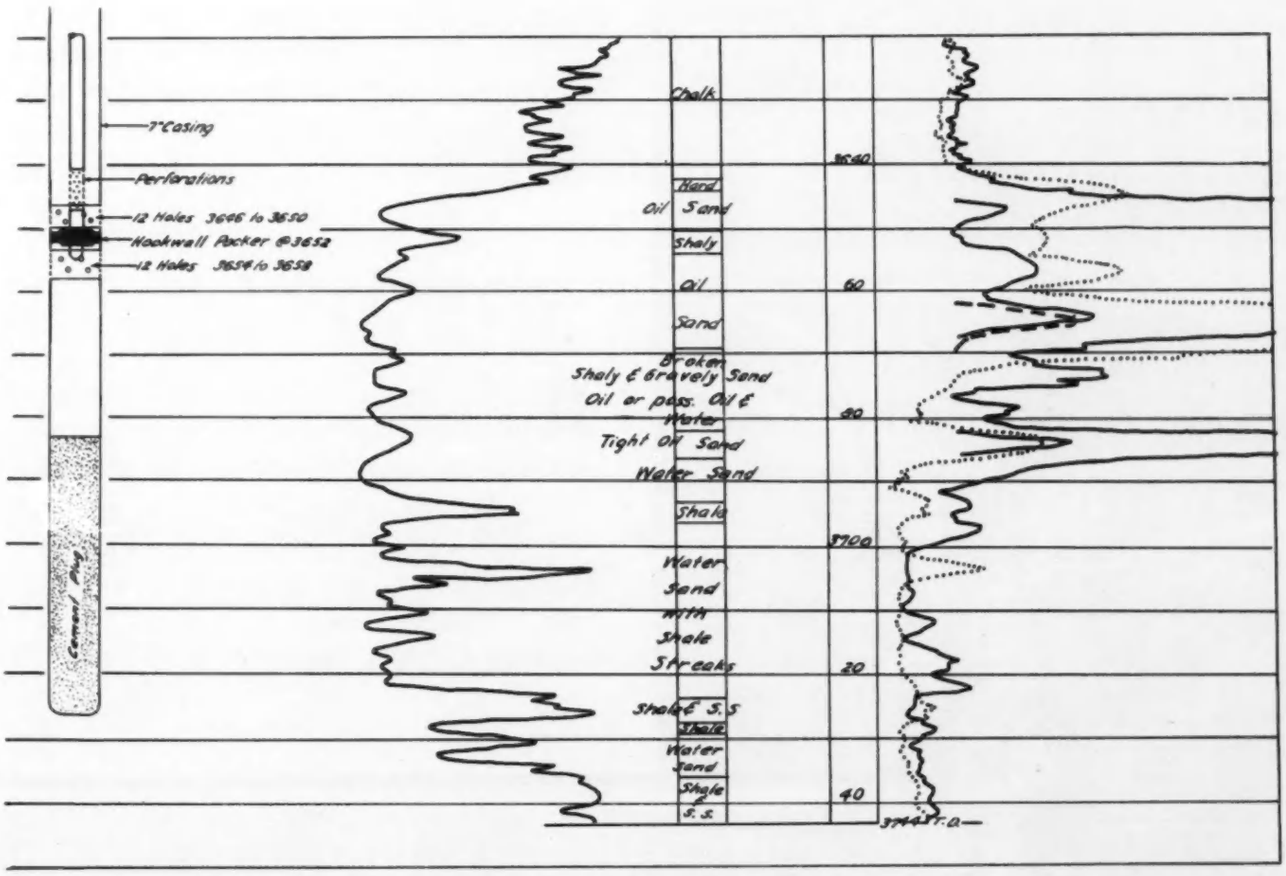

FIGURE 6
Electrical log and location of Hookwall Packer. Well in the R. W. Smith Survey, Rusk County, East Texas field.

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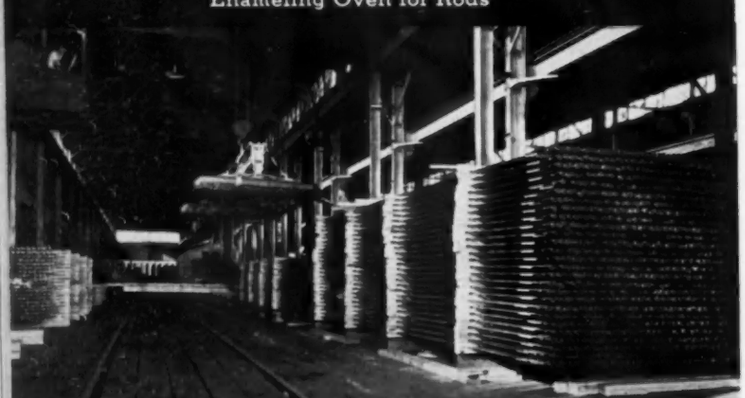

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of time the well has been producing water,

4. Ultimate life of well and possible pay out.

Figure 7 shows the direct relationship between reservoir pressure and the daily water production and the steady increase of the number of wells producing salt water in the East Texas field. Data for the curves were obtained from the records of the Texas Railroad Commission.

Economics of Remedial Work

There is possible damage to reservoir energy and a probability of decrease in ultimate recovery resulting from the production of water with oil. The items which increase the lifting cost by the production of water with oil are:

1. Treating of Emulsions
2. Pumping Larger Quantities of Gross Fluid
3. Salt Water Disposal
   a. Disposal Plants
   b. Impervious Storage Pits
4. Corrosive action on Equipment
5. Possible Damages from Pollution
6. In Event of Gas Lift—More Gas Required.

Investments necessary in the production of salt water are:

1. Artificial-lifting or larger pumping equipment
2. Treating plant equipment
3. Salt Water Disposal Plants
4. Impervious Storage Pits.

In determining whether remedial work can be done profitably, the length of time the well will be free from water after the plug-back must be considered, along with the two intangible factors of preserving the reservoir energy and protecting the surrounding wells, bearing in mind that the production of a barrel of water from the reservoir may have the same effect on reservoir energy as the production of a barrel of oil.

Acknowledgment

The author wishes to acknowledge the contributions of Mr. B. E. Moir, Division Superintendent of The Atlantic Refining Company, Mr. W. S. Morris of the East Texas Engineering Association, and Mr. R. J. Dobson, of the Shell Oil Company, and several operators; also to Messrs. Major and Holland of The Atlantic Refining Company for their assistance in preparing the sketches and curves. I also wish to thank The Atlantic Refining Company for permission to present this paper.

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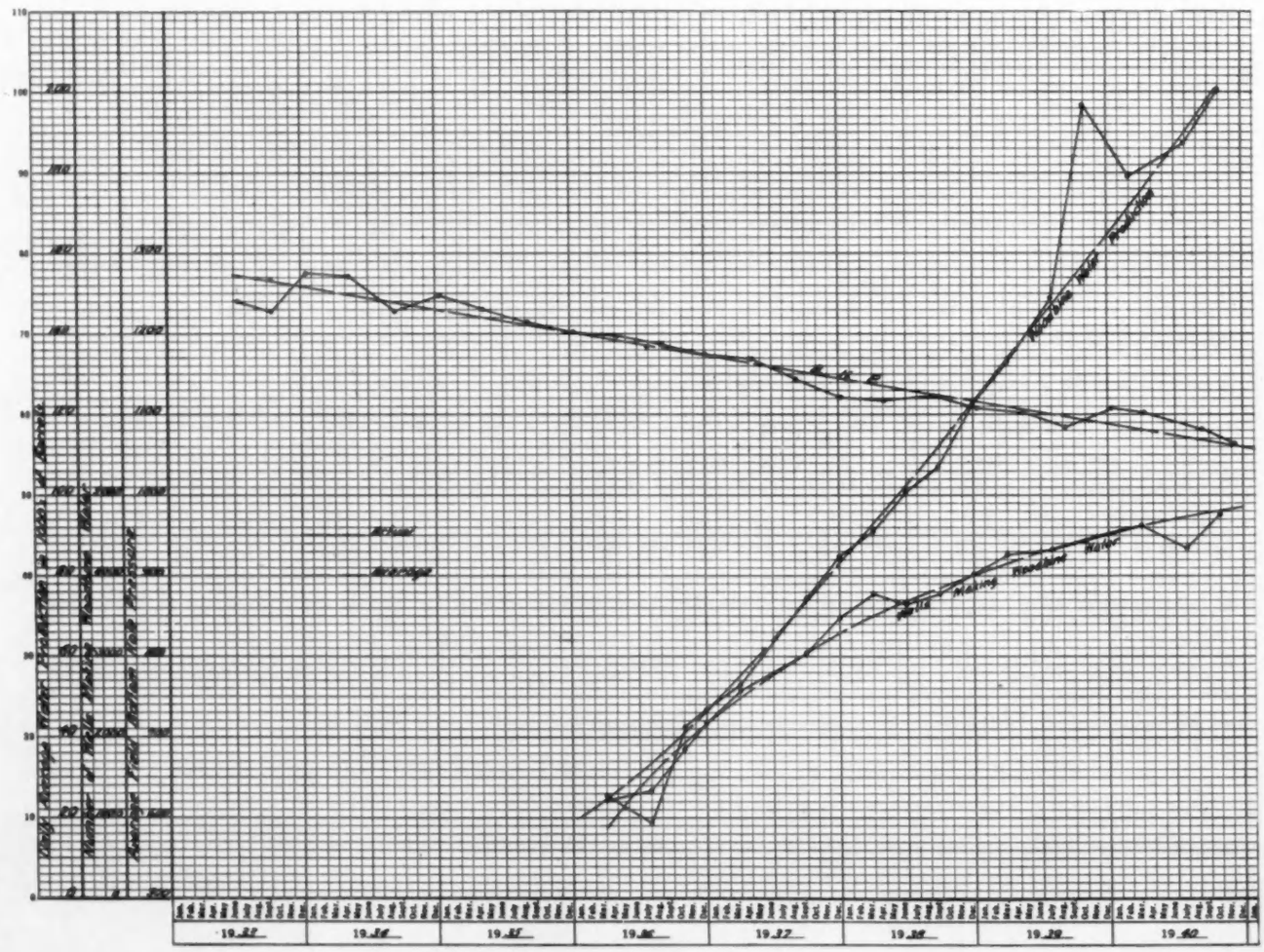

FIGURE 7

Bottom-hole pressure, daily average water production and number of wells producing salt water. East Texas field.

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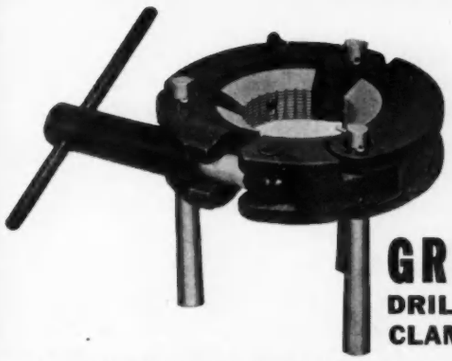

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Since roller type coring tools for hard formations need no inserts, all that is necessary is to hard-face the teeth with Haystellite tube rod by means of the oxy-acetylene process.

When correctly prepared with the help of Haystellite products, either type of core drill will stay sharp longer, and that means better core recovery, more footage of out-to-gauge hole, and economy through a saving of time for round trips to remove dull bits and replace them with sharp ones.

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Haystellite inserts can be set easily in "diamond type" drills by means of copper peening, bronze welding, or by oxy-acetylene welding with a steel rod to act as a binder. By comparison with diamond-set drills, the use of Haystellite inserts materially reduces the cost of drilling, lowering both the initial investment and the operating cost. For example—quoting from an article* written by a geologist with one of the major companies:

"A six-stone diamond bit "N" size will inventory slightly over $3,150.00 . . . in eight months' use the investment may be marked off as total loss. Also, one bad hole may wipe out the entire investment in five minutes and cost several hundred dollars additional trying to recover a stuck bit. On the other hand, $100.00 worth of Haystellite (inserts) will run a drill a year, and if you stick a bit, you have lost only about 60 cents worth of diamond substitutes."

". . . while diamonds will drill somewhat faster in hard rock drilling, the Haystellite (inserts) will equal and better the time in softer material such as shale and sands."

*"Adaptability of Hard Surfacing Materials to Oil Field Diamond Drilling," by Edmond B. Stiles; Reprinted from THE PETROLEUM ENGINEER. A copy will be sent to you upon request.

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This 92-foot derrick breaks down into three sections for convenient moving by truck.

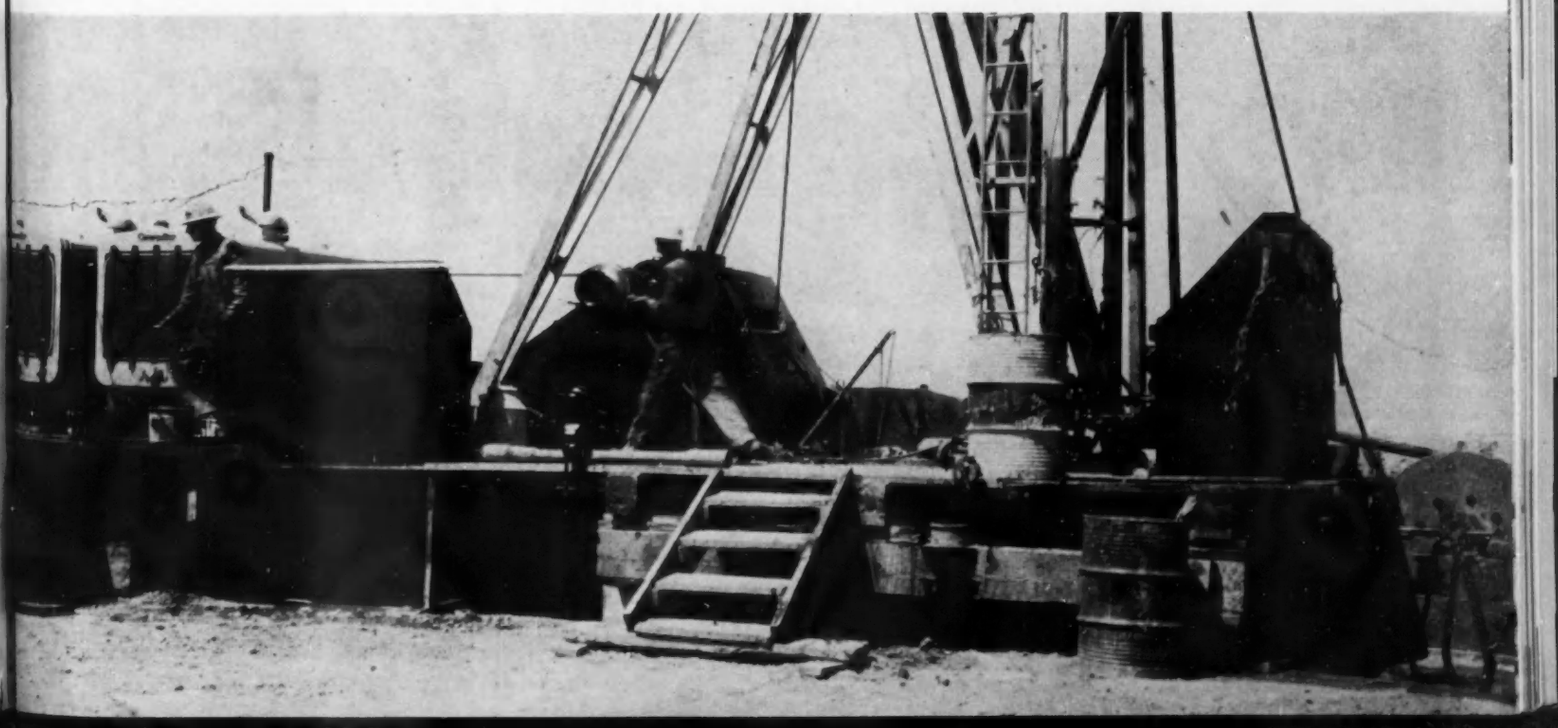
Below is a general view of the rig from driller's side.

Portability in a Rig Set-Up

Methods of reducing down-time while drilling, and of simplifying movement of equipment from location to location, are gaining increased attention from drilling contractors. The set-up here described, used to take hole to 5734 feet in Southwest Texas, employs many features that might be advantageously employed on other rigs, wherever working.

A RIG set-up capable of drilling to at least 6000 feet, yet portable in a limited number of pieces, is being operated by Newman Brothers, drilling contractors of San Antonio. It recently completed two exploratory holes in Cameron County, Texas, to 5734 and 3532 feet, respectively, for The Pure Oil Company, and not a mishap was reported during the entire operation.

In the particular instance of these two operations, The Pure Oil Company primarily was interested in geological information. One preceding deep test had been made in the area, and the two shallower tests were drilled in an effort to determine structural conditions before drilling another deep well. It



was necessary to obtain equipment that would operate efficiently, quickly and inexpensively.

Newman Brothers of which W. C. Newman, Jr., and John E. Newman are the principals, have drilled six wells with this rig, for production purposes as well as for geological exploration. It was employed in the drilling and completion of the discovery of the Kreis field, Duval County, in 1940.

In the latest projects, a string of 200 feet of 8⅝-inch conductor pipe was cemented top to bottom. A 7⅞-inch rock bit was used to drill cement, and a fishtail bit was employed to the bottom of the hole.

The tools are handled in a 92-foot steel derrick, comprised of three sections of approximately 30 feet each that make it easily transported by truck on the highway. The derrick, draw works and engines are set and bolted on I-beams extending the full length. The I-beams, in turn, rest on 12 x 12-inch mud sills.

Drilling pump is 6 x 16 inches, and is chain-driven from a dual drive. One or both engines may be used on the pump at the same time while driving the rotary or draw works. Two 130-horsepower engines and fuel tank are mounted on skids. The engines, while rated at 130 horsepower at 850 revolutions per minute, have been stepped up to 1050 revolution per minute and horsepower increased to 150. In most cases a heavy-duty Diesel engine operates best at 850 revolutions per minute. Operators have found that by using the proper grade or blend of motor fuel, they have been able to increase their power by 25 percent. The engines are in good condition, and their performance justifies the time and effort spent on them as well as the extra cost of the special motor fuel.

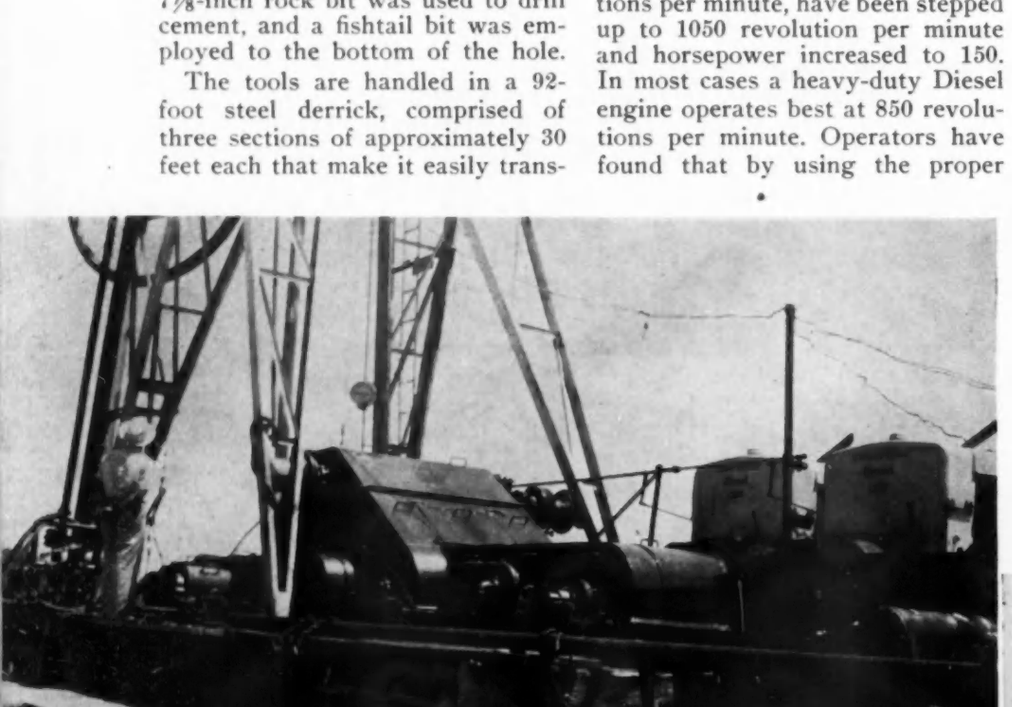
The rotary is a 17-inch unit driven through a gear box from the draw works.

The friction cathead has a per-

At the left, view of rig set-up from slush-pit side shows draw works that drives 17-inch rotary through gear box.

Another angle, lower left, shows chain-driven drilling pump, two 130-horsepower engines, skid-mounted fuel tank.

The cathead shown below has a rope attached for spinning and tonging the pipe when going into the hole.



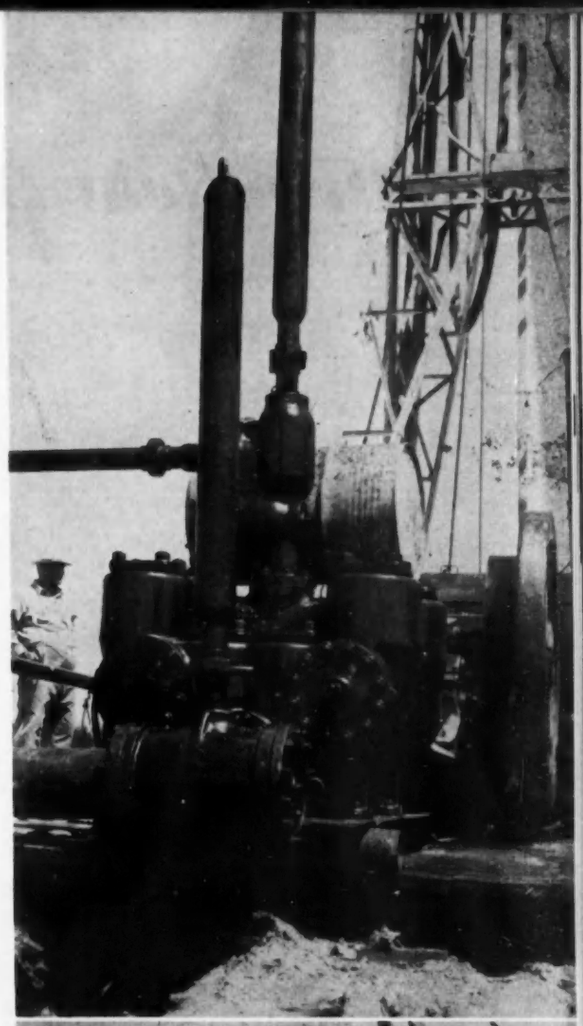
manently attached spinning rope. The cathead only is used to spin and tong the pipe when going in the hole. The 1¼-inch rope had not been replaced on its fourth well. The arrangement provides a saving in the price of rope, provides a safety feature, and permits the driller to see every operation. By shoving down on the lever, the driller engages the friction clutch, by picking up he releases it, and by picking up higher he throws on the back brake, freezing the cathead in a stopped position. The cathead eliminates one man, permitting Newman Brothers to operate efficiently with a four-man crew. An old style cathead is keyed to the line shaft.

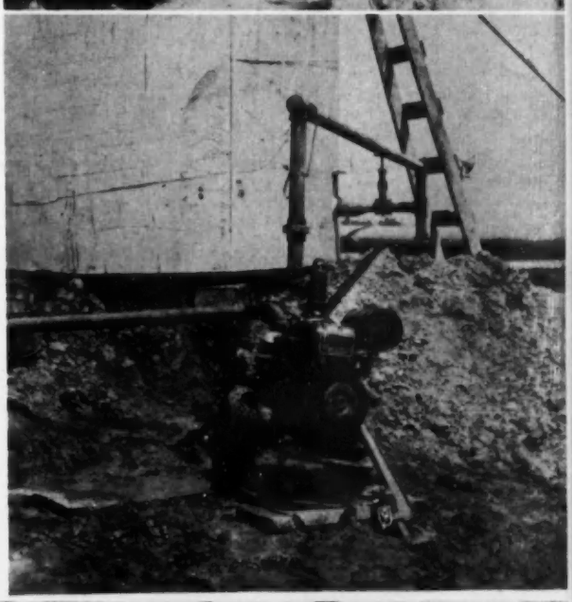
An eight-inch suction strainer handles the mud before it enters the pump. Each day, the screen is taken out and cleaned. Rubbish on the ground under the cap is removed from it. The use of this strainer effects an enormous saving in valves and seats, and pistons and liners, minimizing rig down-time for replacements. A stand-pipe extending upward from the strainer provides a vacuum or damping chamber, tending to level out the suction pulsations and tending to approach the effect of a flooded suction. Another pipe extending upward from the air chamber of the discharge on the pump provides a volume chamber. Another has been placed on the mud line near the stand pipes. The suction strainer, vacuum chamber and volume chambers on the discharge aid to keep the pump operating at maximum efficiency. When running at 55 to 60 revolutions per minute, with pressure from 600 to 800 pounds, there are practically no pulsations discernible in any of the mud lines, stand pipe or hose, and a check of the returns through the flow line into the pits show the pump operating efficiently. Whenever the hose or stand pipe starts pulsating, cleaning the strainer on the suction invariablly eliminates the trouble.

The light plant is driven by a four-cylinder gasoline engine, equipped with a generator and starter. The starter is an additional safety feature.

On the two tests of The Pure Oil Company water for drilling was hauled six miles by truck from Port Isabel. A small power-driven pump is used to unload the truck and pump the water into a 100-barrel water tank. The pump is used also for pumping water, pumping out the cellar, to put mud through the hopper when adding artificial mud, and to transfer mud from one pit to the other. Rubber tires on the unit reduce vibrations of the little single-cylinder engine.

Acknowledgment is made to H. L. Patterson, field superintendent, The Pure Oil Company, for compiling the information.



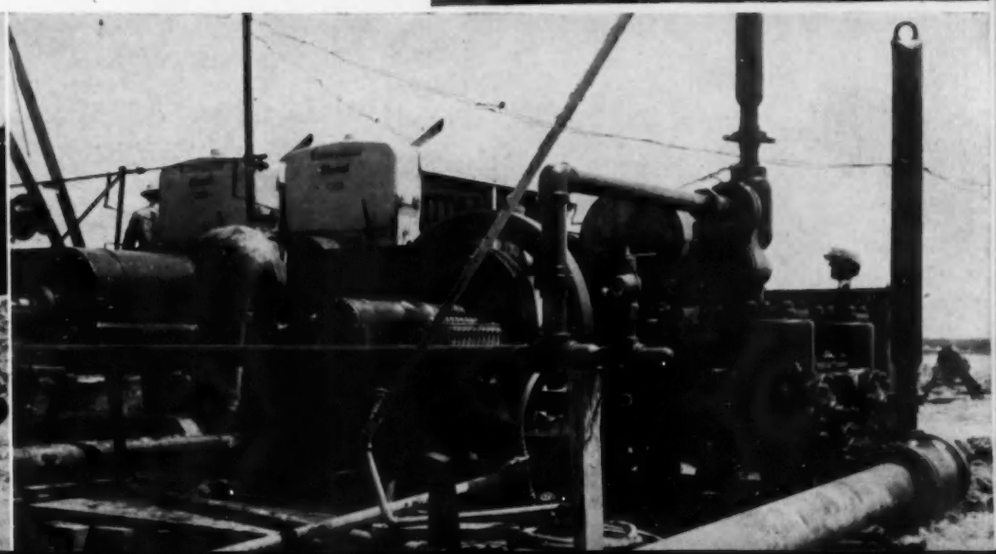


The mud passes through an eight-inch suction strainer before it enters the pump, saving valve and piston parts and lessening replacement down-time.

Portable pump shown at right is used to move water from trucks to lease tank, to pump out cellar, and to put mud through the hopper when conditioning.

A starter on the four-cylinder gasoline engine that drives the light plant, shown at the lower left, is a safety feature.

The view of the mud pump, at lower right, is taken from slush-pit side.



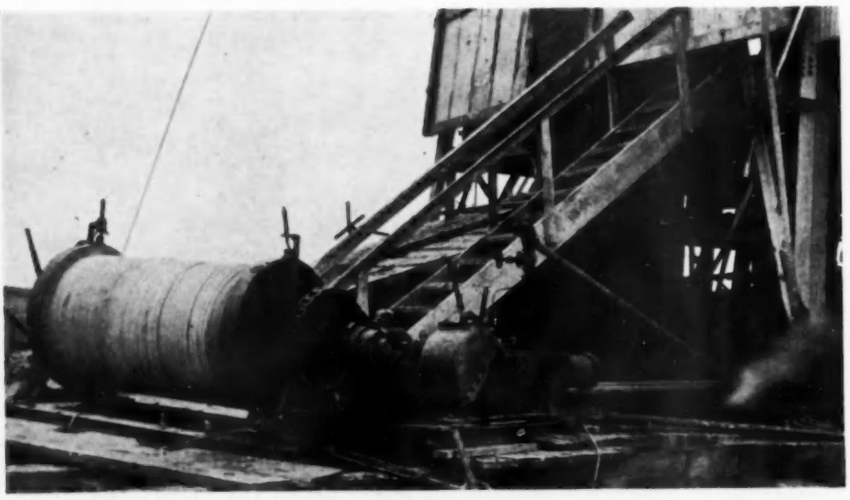
Practical Hints for the Drilling Rig

The following reports on rig practices contain suggestions of a practical nature, designed to improve operating efficiency and safety. These items come from all parts of the United States and give an excellent picture of the ingenuity being brought into play in drilling operations.

Contributions to this page will be paid for at the rate of $5 for each illustrated item accepted. Address contributions "The Editor, THE OIL WEEKLY, Houston, Texas."

1. RIGGING UP

Sand-Line Reel for Coring Is Mounted Off Derrick Floor to Save Space



Working space is gained on the derrick floor by providing a ground mounting for this independently powered sand-line reel used for coring operations.

MOUNTING an independently powered sand-line reel used in wire line coring operations off the derrick floor conserves much needed working space, and permits the sand line to be led through the derrick and down outside in full view of the reel operator.

Flags on the line and visual checking of the line, not only up to the crown block sheave but down as far as the floor housings, enable the operator to maintain as accurate control of the core line as though he were posted on the floor. The greater distance between sheave and drum also facilitates better and smoother spooling.

This unified turbine pump, V-belt drive, gas engine, scrubbers, tool box and pipe rack simplifies equipment transporting.

2. TRANSPORTATION

Unitization of Water Well Outfit

DRILLING and maintaining a small well to supply water for boilers, rotary equipment and drilling mud is a relatively small, but nevertheless important task from the standpoint of time consumed.

A West Texas field operator has streamlined this operation by mounting a small deep-well turbine pump, V-belt drive, gas engine, gas scrubbers, pipe rack and tool box on a single portable steel skid base 6 feet wide by 13 feet long.

The pump head projects up through the floor opening in the center of one end of the base, and the engine is mounted on the other end. The pipe rack holds 10 to 12 10-foot joints of 4-inch casing necessary to make up any slight differences in depth to which it is necessary to drill to contact the water sand on each location. The engine is equipped to handle either gasoline or gas. Two short, well-braced scrubber tanks are mounted in the center of the non-skid steel platform to clean the gas. A sturdy steel tool box, welded permanently in one corner near the engine, accommodates miscellaneous fittings, wrenches and special tools needed on the pump.

Transportation is a simple matter, as the entire assembly can be picked up and carried easily by a winch-equipped truck.

3. ENGINE CARE

Heating Fuel Gives Better Performance

DURING cold winter months in the Mid-Continent fields, operators who use butane fuel for their drilling engines usually find their fuel consumption increases considerably due to the richer, less volatile mixture that the carburetors are forced to take.

One contractor operating in the Ellinwood area of Western Kansas obtained a saving in fuel costs by running a 2-inch fuel line through a 12-foot section of 8-inch exhaust pipe coming from the drilling and mud-pump engines. The arrangement also provided a shorter warming-up period, greater flexibility of

Selected for Ability
GARDNER-DENVER "FX" SLUSH PUMPS

Ability to keep working under toughest conditions—special ruggedness to assure *continuously* reliable performance! That's why Gardner-Denver "FX" Power Slush Pumps are first choice among so many experienced oil men.

Here's the background of "FX" performance—

★ Divided fluid cylinder construction leaves no inner baffles or metal sections to be cut through by mud.

★ SLUSH-PROOF hardened liners and rods—SLUSH-PROOF Duo-Seat valves are regular equipment for all Slush Pumps.

★ Positive, automatic flood lubrication eliminates oil pipes and assures adequate lubrication of all working parts.

★ Oil-stop and mud-stop heads keep mud and water out of power end.

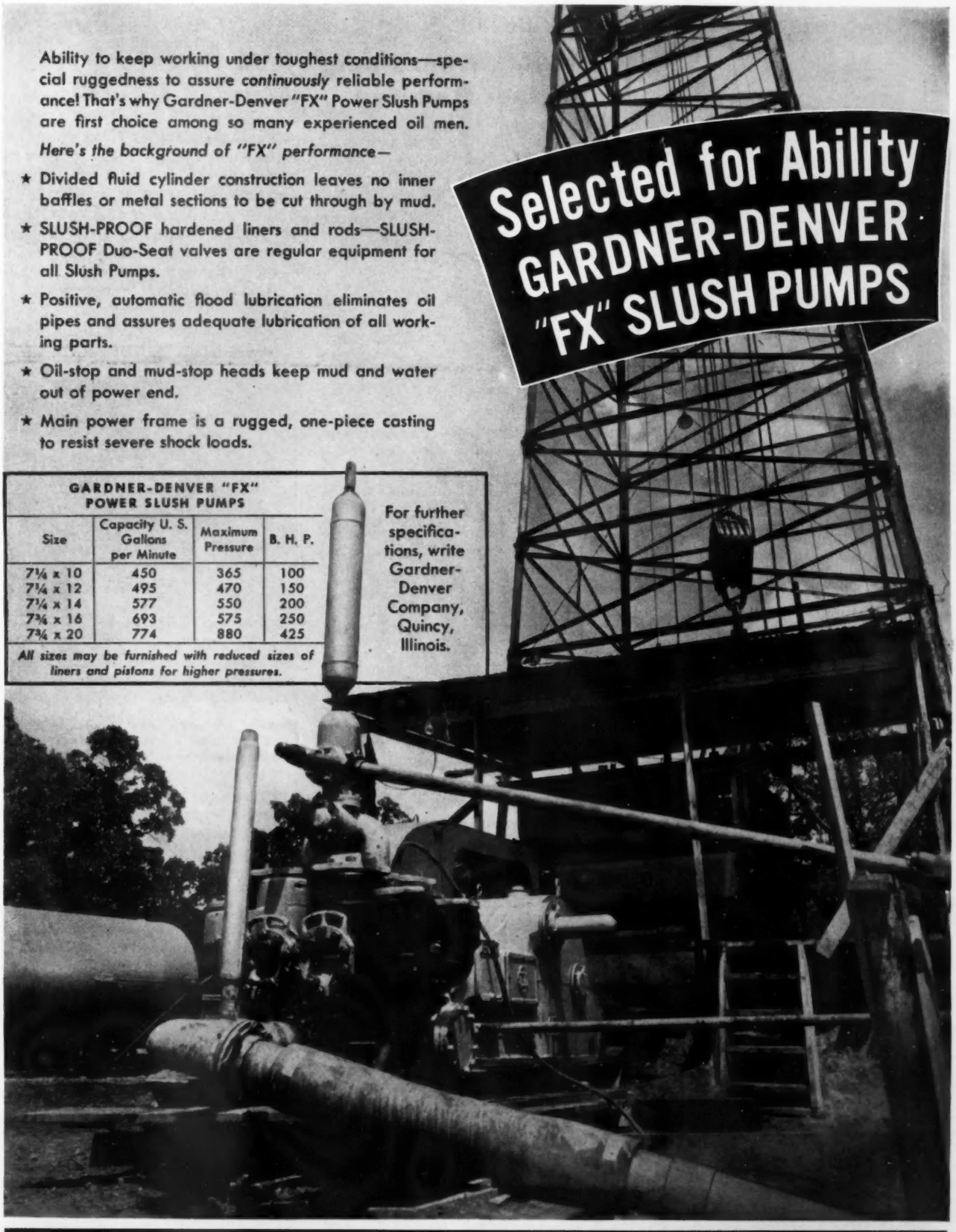
★ Main power frame is a rugged, one-piece casting to resist severe shock loads.

GARDNER-DENVER "FX" POWER SLUSH PUMPS

Size	Capacity U. S. Gallons per Minute	Maximum Pressure	B. H. P.
7¼ x 10	450	365	100
7¼ x 12	495	470	150
7¼ x 14	577	550	200
7¾ x 16	693	575	250
7¾ x 20	774	880	425

All sizes may be furnished with reduced sizes of liners and pistons for higher pressures.

For further specifications, write Gardner-Denver Company, Quincy, Illinois.



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Continental Supply Co., Continental Building, Dallas, Texas • Republic Supply Co. (of California) 2122 E. 7th St., Los Angeles, Calif.

Cold-weather drilling is facilitated by this arrangement to heat engine fuel.

power, and less trouble in carburetion adjustments.

A nipple and elbow was welded into the exhaust line at a point near the carburetor to connect the outside to the gas line within. A union connection was provided in the gas line just outside the end of the exhaust so that the line can be easily broken down while moving from one location to another, leaving the section of 2-inch pipe permanently within the exhaust line.

A rotary hose section connecting mud line to standpipe eliminates a source of vibration and wear on the couplings.

4. RIGGING UP

Vibration from Pump Engines Reduced

SEVERAL contractors operating in California's Wilmington field have adopted a set-up that practically eliminates throbbing and vibrations in the mud standpipe due to the action of the mud pumps.

Instead of using a rigid connection consisting of a length of pipe and solid couplings to connect the mud lines to the bottom of the standpipe, a short section of rotary hose is connected to the mud line below the derrick floor. It is brought up through a hole in the floor to connect to the standpipe by a union and a fitting welded into the latter at an angle of about 50 degrees.

Since most of the activity in this field is town-lot drilling, pumps, sumps, boilers and other equipment must be grouped as close to the rig as possible. Accordingly, mud-pump pulsations felt in the standpipe and derrick were bad. Skidding the rig from one location to another is simplified by elimination of the fittings and couplings with which the standpipe is usually connected to the pumps.

The rotary hose is wrapped and tied with several turns of canvas or light belting where it comes in contact with the wooden floor to eliminate wear due to the vibrations.

5. MUD HANDLING

Degassifier Used in Conditioning

A SIMPLE solution to the problem of eliminating occluded gas in the drilling mud has been found by a California operator.

A 4-foot length of 16-inch casing, set at approximately a 10-degree angle, with the inside surface provided with a series of welded steel baffle plates, was built up on legs to stand on top of the mud ditch at any convenient place in the system, preferably as close as possible to the mud outflow line leading from the casing.

Gas-cut mud coming from the pumps is forced through a set of twin jets that enter the cylinder from the upper end. As it strikes the baffle plates and falls to the bottom and lower end of the chamber, a large part of the gas is liberated and escapes through a large opening in the top of the cylinder. An inverted rectangular funnel of light steel conducts the gas to the atmosphere, and the mud flows through an opening in the lower end of the chamber and on out into the ditch. Approximately 30 percent of the circulating mud is diverted through the device.

A 3-inch line coming from the pumps is divided just before entering the degassifier, and two 3-inch nipples extending inside the chamber are then reduced down to 1½- to 2-inch jets, the size depending upon mud conditions. The 3-inch jet assembly is welded to a circular steel plate cover. The cover can be quickly removed from the cylinder by disconnecting the 3-inch union on the line, and removing four bolts from steel ears that are welded to the body of the chamber.

Drilling through gas zones is facilitated by this degassifier, designed to handle one-third of the circulating mud.

Provision has been made for forcibly removing the gas from the chamber when unusually large quantities of gas are encountered in the mud. A 2-inch tee was placed on the top of the inverted cone covering, so that a steam line could be attached to one side of the tee, with a 5-foot exhaust pipe on the other end. When steam pressure is applied, the resulting jet-action serves to forcibly remove and exhaust most of the gas from the chamber.

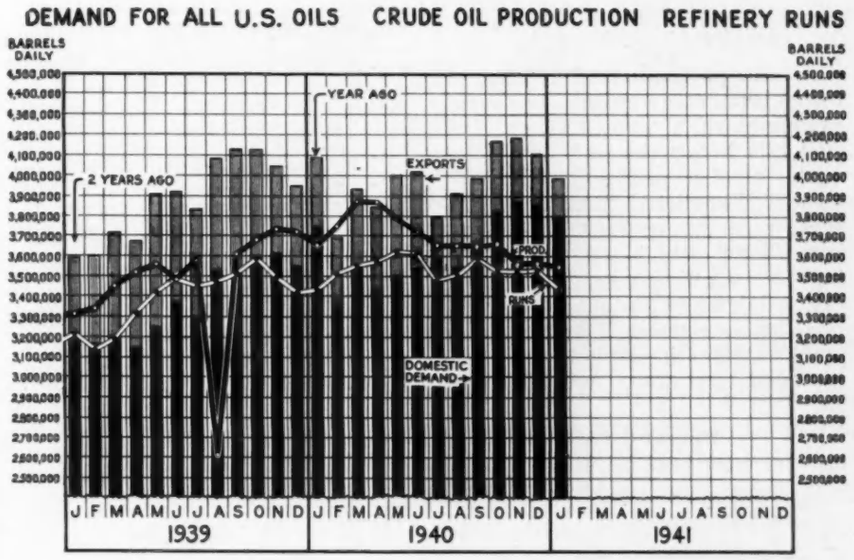
The degassifier has its greatest use when known high-pressure gas zones are penetrated.

Export-Import Situation Only Market Threat

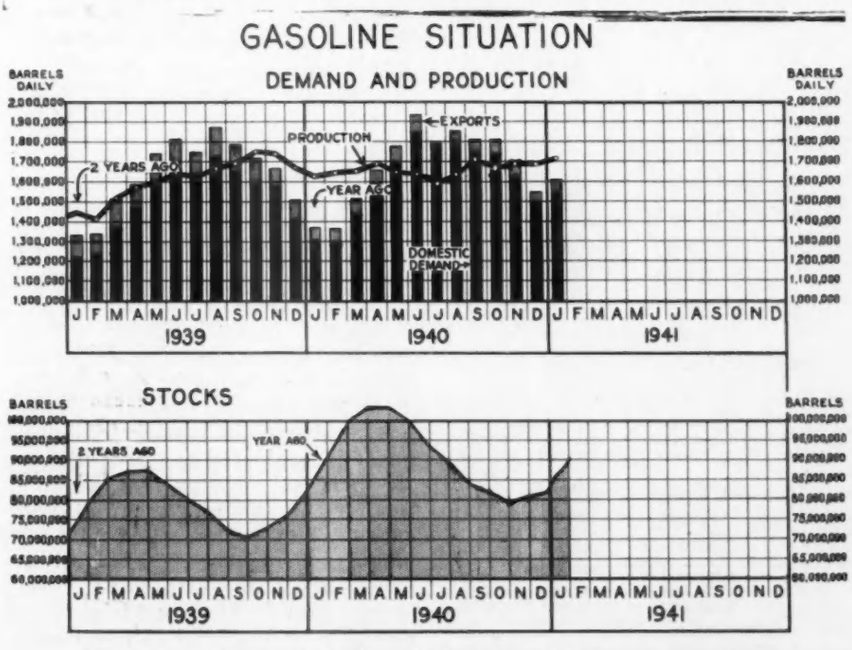
By WILLIAM H. STRANG

FINAL statistics on the export and import of United States crude and refined products during 1940, as compiled by the United States Bureau of Mines, reveal that the tendency toward unfavorable balance, in effect throughout the year, was increased by import of 8,258,000 barrels of crude and refined products in December, against an export volume of 6,991,000 barrels. Blockades affecting our best European customers will presumably be tightened during 1941, the embargo on aviation gasoline is not likely to be lifted during this period, and there are many conceivable shifts in the international political situation which might leave us with Canada as our only customer due to the loss of Russia, Japan and the West Indies.

Reaction of all these factors would reduce United States crude exports to something little more than the 1,000,000-barrel monthly average taken by Canada during 1940. On the more optimistic side, there is a possibility that the reduction in exports to steady customers during the latter months of 1940 was a temporary condition, particularly in Japan and Canada, and that the jump in imports was also a temporary effect of the hemisphere defense and good will programs, linked with pressure of accumulating crude stocks in South America. Undoubtedly some of the November - December import volume was rushed to fill reciprocal trade treaty agreements.


DEMAND FOR ALL U.S. OILS
CRUDE OIL PRODUCTION
REFINERY RUNS
BARRELS DAILY
YEAR AGO
2 YEARS AGO
EXPORTS
DOMESTIC DEMAND
RUNS
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1939
1940
1941

Source: Bureau of Mines, except data for January, 1941, which is estimated


GASOLINE SITUATION
DEMAND AND PRODUCTION
BARRELS DAILY
PRODUCTION
EXPORTS
2 YEARS AGO
YEAR AGO
DOMESTIC DEMAND
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
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STOCKS
BARRELS
2 YEARS AGO
YEAR AGO
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1939
1940
1941

Source: Bureau of Mines and American Petroleum Institute

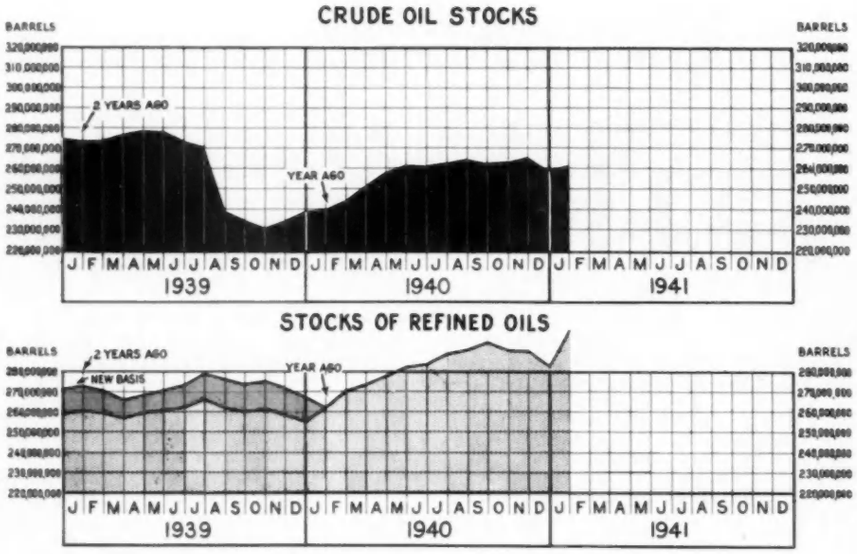
With due consideration to the importance of foreign markets in the welfare of the American oil industry, it may still be said that the worst combination of circumstances affecting foreign trade will not depress internal conditions to a serious extent. Final figures on the 1940 demand for United States oils, crude and refined, reflect a gain in daily average demand of 2.1 percent, representing an increase of 82,000 barrels daily effected in spite of a 30.9 percent reduction in total exports. Demand for domestic crude increased 7.2 percent, creating a daily market for 243,000 additional barrels. Forecasts of domestic demand for 1941 promise a 5- to 10-percent increase which would take the sting out of the loss of a major portion of the export market for most companies.

With exceptions of aviation gasoline, coke, asphalt, road oil, and miscellaneous items, export of petroleum products diminished in 1940. With the exception of coke,

domestic consumption of petroleum products increased in 1940, with the quantities entailed in these increases being generally larger than the export losses. Largest comparative gain in domestic demand was the 18.5 percent increase registered for light fuel oils and distillates. Largest drop in exports was in motor fuel, including aviation gasoline, off 43.8 percent in 1940, and kerosene, off 59.1 percent.

Stocks Above Year Ago

Stocks of crude and refined oil on February 8 were above the inventories of a year ago, residual fuel oils being the only exception with a 2.4 percent difference. Crude oil stocks at 260,250,000 barrels were 8.7 percent above last year's level, which was still reflecting the shutdown in August. Increased demand and a better statistical balance of crude and gasoline stocks render it unlikely that any remedial shutdown will be contemplated in the first part of 1941. Gas oil and distillate fuel stocks were 41.1 percent above the February 10, 1940, level, a condition aggravated in the winter months by the unprecedented demand for residual fuel oils. Gasoline stocks gained 1.8 percent over the inventory of February 10, 1940, another reflection of increased residual fuel oil demand.


CRUDE OIL STOCKS
BARRELS
2 YEARS AGO
YEAR AGO
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1939
1940
1941
STOCKS OF REFINED OILS
2 YEARS AGO
NEW BASIS
YEAR AGO

Source: Bureau of Mines

In the latest projection of current trends issued by the United States Bureau of Mines, these statements occur: "The domestic demand for motor fuel in February is estimated as 39,000,000 barrels, the daily average of which is 7.6 percent higher than the actual demand in February, 1940. The estimate of exports for motor fuel, based upon forecasts by the principal exporters, is 1,800,000 barrels compared to an actual export of 1,900,000 barrels in February, 1940. The bureau is estimating an increase in finished gasoline stocks of 5,800,000 barrels, which is 2,000,000 barrels less than the increase in February, 1940, when the heavy demand for heating oils entailed large runs to stills."

Previously the bureau had estimated a peak of 96,000,000 barrels in gasoline stocks at March 1, 1941, as compared with almost 104,000,000 barrels at that time in 1940. This anticipation followed from a prediction of an inventory of 82,000,000 barrels on December 31, 1940, a level actually exceeded by 1,400,000 barrels. Unless the 90,864,000-barrel inventory of February 1 is subjected to another drastic increase, such as that which it incurred in the first week of February, when stocks leaped 2,401,000 barrels, the 96,000,000-barrel approximation for March 1, 1941, should stand. That stock position would be a material improvement because of the expected increase

Demand for All Oils 2 Percent Higher in 1940

	DECEMBER			YEAR		
	1939	1940	Percent Change	1939	1940	Percent Change
SUMMARY						
Total Demand	123,939,000	127,267,000	+ 2.9	1,420,035,000	1,453,989,000	+ 2.4
Daily Average	3,998,000	4,105,000	+ 2.7	3,891,000	3,973,000	+ 2.1
Exports:						
Crude Petroleum	4,656,000	2,074,000	— 55.5	72,076,000	51,600,000	— 28.4
Refined Products	8,557,000	4,917,000†	— 42.5	116,883,000	78,989,000	— 32.4
Total Exports	13,213,000	6,991,000	— 47.1	188,959,000	130,589,000	— 30.9
Domestic Demand:						
Total Domestic Demand	110,726,000	120,276,000	+ 8.6	1,231,076,000	3,323,400,000	+ 7.5
Daily Average	3,572,000	3,880,000	+ 8.6	3,373,000	3,616,000	+ 7.2
TOTAL DEMAND FOR PRODUCTS						
Motor Fuel:						
Domestic	43,807,000	46,413,000	+ 5.9	555,509,000	589,424,000	+ 6.1
Exports	3,136,000	1,983,000	— 36.8	44,638,000	25,107,000	— 43.8
Total	46,943,000	48,396,000	+ 3.1	600,147,000	614,531,000	+ 2.4
Aviation Gasoline: (included above):						
Domestic	292,000	494,000	+ 69.2	*	5,368,000	.....
Exports	372,000	497,000‡	+ 33.6	4,234,000	4,295,000	+ 1.4
Total	664,000	991,000	+ 49.2	.....	9,663,000	.....
Kerosene:						
Domestic	6,613,000	7,808,000	+ 18.1	60,503,000	68,776,000	+ 13.7
Exports	652,000	116,000	— 82.2	8,241,000	3,374,000	— 59.1
Total	7,265,000	7,924,000	+ 9.1	68,744,000	72,150,000	+ 5.0
Gas Oil and Distillate Fuels:						
Domestic	17,168,000	19,992,000	+ 16.4	138,723,000	164,448,000	+ 18.5
Exports	1,998,000	953,000	— 52.3	32,020,000	19,172,000	— 40.1
Total	19,166,000	20,945,000	+ 9.3	170,743,000	183,620,000	+ 7.5
Residual Fuel Oils:						
Domestic	31,262,000	33,665,000	+ 7.7	319,738,000	335,655,000	+ 5.0
Exports	1,320,000	913,000	— 30.8	17,485,000	16,077,000	— 8.1
Total	32,582,000	34,578,000	+ 6.1	337,223,000	351,732,000	+ 4.3
Lubricants:						
Domestic	1,825,000	1,875,000	+ 2.7	23,713,000	24,657,000	+ 4.0
Exports	1,310,000	588,000	— 55.1	11,881,000	10,494,000	— 11.7
Total	3,135,000	2,463,000	— 21.4	35,594,000	35,151,000	— 1.2
Wax (pounds):						
Domestic	43,971,000	31,538,000	— 28.3	325,461,000	356,653,000	+ 9.6
Exports	14,603,000	8,778,000	— 39.9	232,664,000	190,065,000	— 18.1
Total	58,574,000	40,316,000	— 31.2	558,125,000	546,718,000	— 2.1
Coke (short tons):						
Domestic	123,600	140,500	+ 13.7	1,421,700	1,403,500	— 1.3
Exports	12,600	25,700	+ 51.0	286,200	302,100	+ 5.3
Total	136,200	166,200	+ 22.0	1,707,900	1,705,600	— 0.1
Asphalt (short tons):						
Domestic	257,000	238,700	— 7.1	4,926,100	5,123,600	+ 4.0
Exports	2,200	28,700	+ 92.3	42,400	296,800	+600.0
Total	259,200	267,400	+ 3.1	4,968,500	5,420,400	+ 9.1
Road Oil:						
Domestic	71,000	169,000	+138.0	7,846,000	7,847,000	+ .01
Miscellaneous:						
Domestic	206,000	219,000	+ 6.3	2,223,000	2,175,000	— 2.2
Exports	14,000	47,000	+235.7	123,000	944,000	+667.5
Total	220,000	266,000	+ 17.3	2,346,000	3,119,000	+ 32.9

* Not available. † Exclusive of 12,000 barrels exported from non-contiguous territories but inclusive of 457,000 barrels shipped from U. S. to territories. ‡ Includes 77,000 barrels anti-knock compounds.

They're designed SCIENTIFICALLY

One of the new Bethlehem Pumping Units Type 51-DT-10, hard at work on the Hall Pool field, Russell, Kansas

to lower lifting costs

Throughout the Mid-Continent Field, scores of well operators have slashed lifting costs per barrel by specifying the new Bethlehem Pumping Units. Why? Because these Bethlehem Pumping Units have been scientifically designed for greater efficiency and more economical operation. Not a single feature has been overlooked, not a single refinement omitted that is needed to make a better-coordinated, more efficient, more dependable pumping unit.

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Gear box: 100 per cent roller bearing.
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Structural: Rubber mounting of upper pitman assembly.
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in domestic motor fuel consumption, and also because the figure would include an increase of several million barrels in essential aviation gasoline stocks.

Tanker Rates Down

Chartering rates on oil tankers have decreased substantially in the past few months, and are not expected to regain their December level during the rest of the winter, according to the United States Maritime Commission. The commission noted an announcement of December 19, that there was adequate tanker tonnage available for the needs of this country, had been borne out, and that sufficient tonnage would be available for the rest of the winter. Specific commission recommendations to oil companies were (1) utilization of heating and fuel oil stocks in a measure greater than normal; (2) elimination, to the greatest possible extent, of long hauls and the employment of vessels eligible for coastwise trade in foreign service, and (3) avoidance of unnecessarily large stocks, particularly of gasoline.

Improvement in tanker rates on various products from Gulf ports to points east of Hatteras has been marked. Rates for December, 1940, January 4, 1941, January 21, 1941, and February 15, 1941, were as follows: Gasoline, 70, 55, 55 and 36 cents; kerosene, 75, 58 and 57 cents; heavy crude, 66, 66, 66 and 56 cents; light crude, 59, 59, 59 and 46 cents.

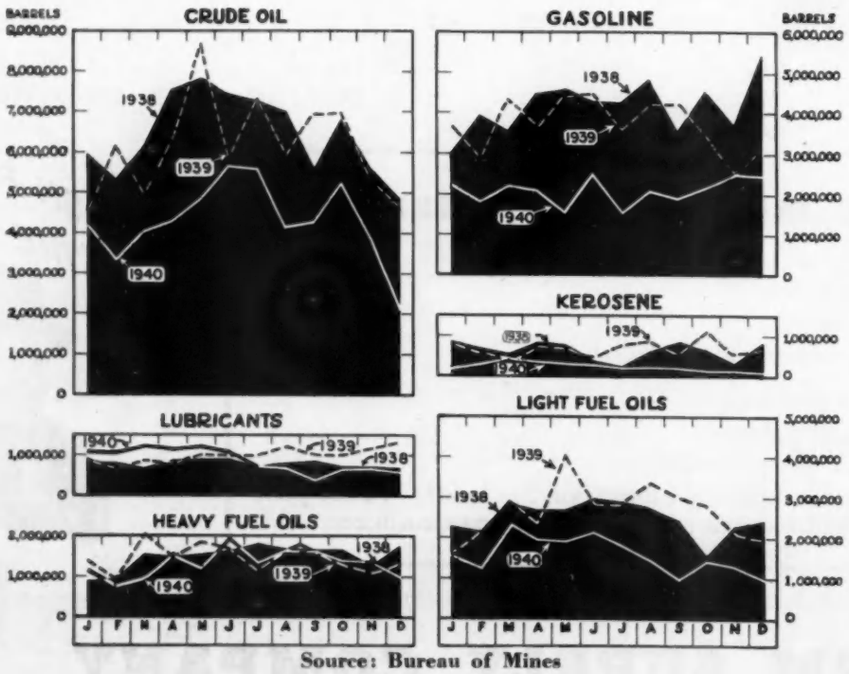
Summary of Bureau of Mines Forecasts for February, 1941
(Barrels)

	Forecast February, 1941	Forecast January, 1941	Actual February, 1940	Percent Change for February, 1940–1941
Demand for Motor Fuel*:				
Domestic demand	39,000,000	43,000,000	37,557,000	+ 3.8
Exports	1,800,000	1,900,000	1,903,000	— 5.7
	40,800,000	44,900,000	39,460,000	+ 3.3
Supply of Motor Fuel:				
Straight-run and cracked gasoline production	42,200,000	46,180,000	43,186,000	— 2.3
Natural gasoline used at refineries	3,100,000	3,520,000	3,067,000	+ 1.1
Total refinery production	45,300,000	49,700,000	46,253,000	— 2.1
Benzol and other natural gasoline	1,300,000	1,500,000	1,062,000	+18.3
Imports	.....	.....	3,000	.....
Increase in finished stocks	5,800,000	6,300,000	7,858,000	—35.5
Available supply	40,800,000	44,900,000	39,460,000	+ 3.3
Crude Oil Requirements:				
Percent yield of gasoline from crude	42.49	42.59	42.44	+ 0.1
Refinery crude required	99,310,000	108,420,000	101,766,000	— 2.5
Daily average	3,546,800	3,497,400	3,509,200	+ 1.1
Foreign crude runs	3,500,000	3,700,000	2,166,000	—38.1
Exports	3,500,000	3,900,000	3,327,000	— 4.9
Fuel and losses	2,300,000	2,700,000	1,172,000	—49.0
Total demand for domestic crude	101,610,000	111,320,000	104,099,000	— 2.4
Daily average	3,628,900	3,591,000	3,589,600	+10.8
Increase in domestic stocks	.....	.....	4,569,000	.....
Actual production	.....	.....	108,668,000	.....
Daily average	.....	.....	3,747,200	.....

* The term "Motor Fuel" as used in this report includes gasoline, naphtha, and benzol used for all purposes, but does not include heavier distillates used in the operation of tractors or burned in Diesel engines.

The United States Bureau of Customs preliminary figures on imports of crude oil and fuel oil within quota limitations provided under trade agreements, covering January, 1941, show that Venezuela sent 132,232,000 gallons on a yearly quota of 1,913,049,600 gallons; Netherlands, 62,112,457 gallons on a 578,806,200-gallon quota; Colombia 6,581,305 gallons on an 86,956,800-gallon quota, and other countries, mostly Mexico, 46,160,567 gallons on a 138,587,400-gallon quota.

Imports for 1940 showed tremendous gains over those of 1939. Crude oil imports for 1939 totalled 28,477,000 barrels, increasing 46 percent to 41,525,000 barrels. Re-



Source: Bureau of Mines

Changes from Year Ago in Stocks of Crude and Refined Oils in the United States

(Figures indicate barrels)

LATEST WEEKLY DATA

(Sources: Crude stocks, Bureau of Mines; all other figures American Petroleum Institute.)

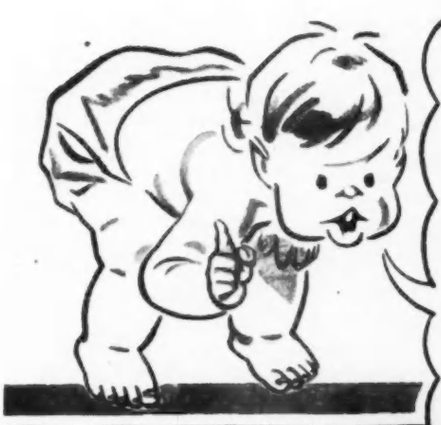
STOCKS OF:	February 8, 1941	February 10, 1940	Percent Change
Gasoline	93,265,000	91,649,000	+ 1.8
Gas Oil & Distillate	36,709,000	26,007,000	+41.1
Residual Fuel Oil	99,921,000	102,344,000	— 2.4
Crude Oil	260,250,000	239,510,000	+ 8.7

LATEST MONTHLY DATA

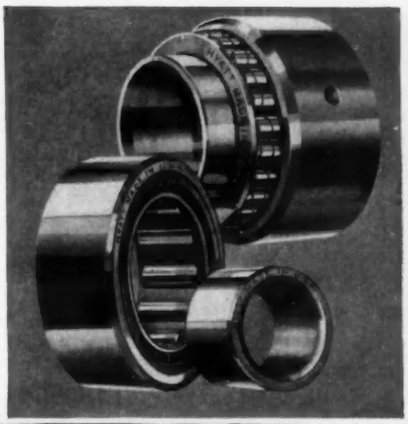
(Source: Bureau of Mines)

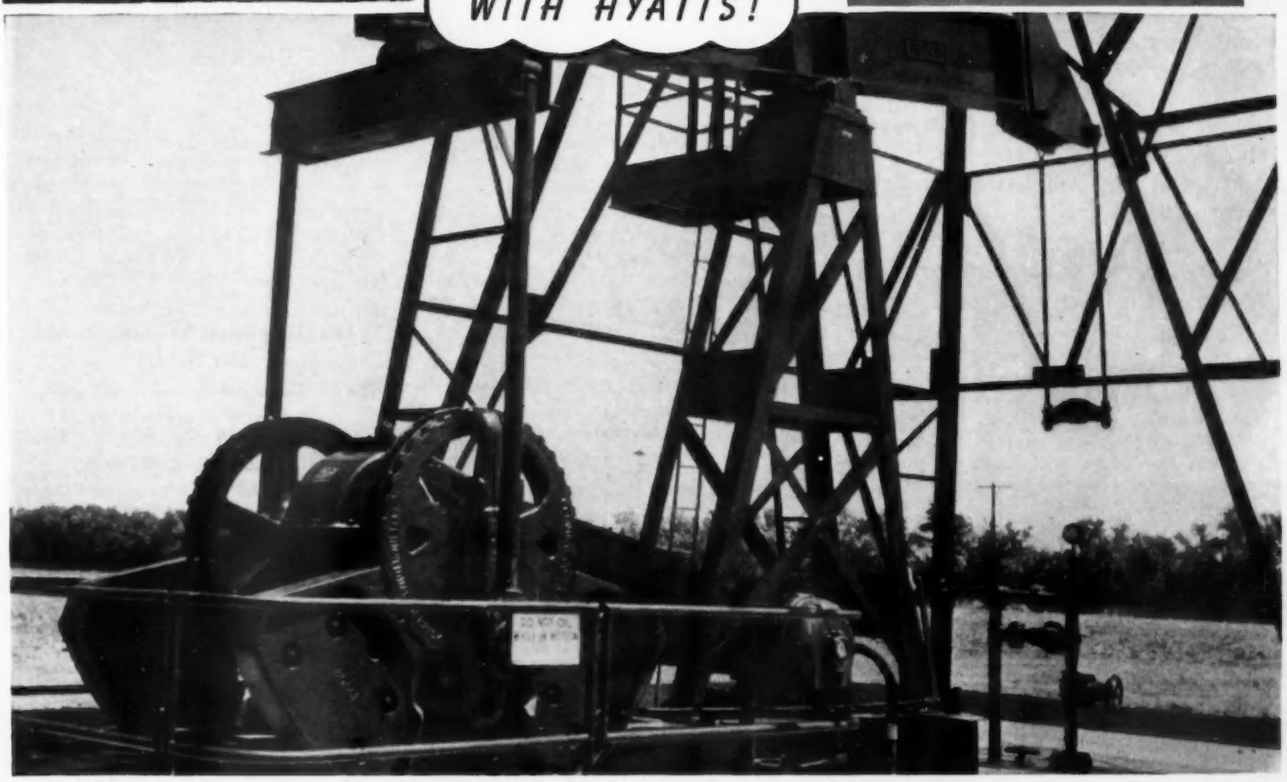
ITEM	Stocks at End of December 1939	1940	Percent Change
SUMMARY—			
Crude Petroleum:			
Refinable in U.S.	239,978,000	264,079,000	+ 10.0
Heavy in California	13,330,000	11,906,000	— 10.7
Natural Gasoline	4,421,000	5,704,000	+ 29.0
Refined Products	268,109,000	282,265,000	+ 5.3
Total, all Oils	525,838,000	563,954,000	+ 7.3
Day's Supply:			
December Basis	132	137	+ 3.8
Year's Basis	135	142	+ 5.2
PRODUCTS—			
Gasoline:			
Finished	77,301,000	77,943,000	+ 0.8
Unfinished	4,421,000	5,704,000	+ 29.0
Total	81,722,000	83,647,000	+ 2.4
Aviation Gasoline (Included above)	2,771,000	6,285,000	+126.8
Kerosene	7,576,000	9,512,000	+ 25.6
*Gas Oil & Distillate Fuels	26,374,000	32,082,000	+ 21.6
*Residual Fuel Oils	87,774,000	83,548,000	— 4.8
Lubricants	7,142,000	8,767,000	+ 22.8
Wax (Pounds)	75,648,000	125,272,000	+ 65.6
Coke (Short Tons)	666,000	487,000	— 26.9
Asphalt (Short Tons)	550,000	614,000	+ 11.6
Road Oil	702,000	624,000	— 11.1
Miscellaneous	276,000	359,000	+ 30.1
Other Unfinished Oils	36,915,000	40,091,000	+ 8.6

* At refineries only.



THE FOLKS WHO DESIGNED THAT EQUIPMENT KNEW THEIR STUFF, ALL RIGHT. THEY WANTED PERFECT ALIGNMENT SO THEY LINED UP WITH HYATTS!





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HYATT

ROLLER BEARINGS

QUIET

fined products imported in 1940 totalled 27,498,000 barrels, up 276.8 percent from 1939. Total imports of all oils was up 93.1 percent from 1939. Much of this volume is due to the pressure of accumulated stocks in South America, a condition which may be expected to prevail for the duration of the war. The 8,258,000 barrels imported during December, 1940, established a new record, the volume being double the average of last winter, and over triple that of the winter season two years ago. The bureau took cognizance of the presence of this large amount of foreign crude in American storage by predicting a run to stills of 3,500,000 barrels during February, 1941, compared to runs of 2,166,000 barrels in February, 1940.

Shell Awards Contract for Rubber Ingredient Plant

Shell Oil Company has announced award of a contract for construction of a plant at its Houston refinery for manufacture of butadiene, basic ingredient of synthetic rubber.

Scheduled to be in operation by early summer, the plant will have an annual capacity in excess of 5000 tons. Contract for the new plant has been awarded to C. F. Braun Company, Alhambra, California, and construction will start immediately.

Bureau Reports 1940 Crude Runs 1,294,283,000 Barrels

Total crude runs to stills in 1940 totaled 1,294,283,000 barrels, an increase of 56,443,000 barrels over the preceding year, averaging 3,536,000 barrels a day, it was reported February 18 by the United States Bureau of Mines.

Imports of crude for the year were 42,738,000 barrels, an average of 117,000 barrels a day, with 1,213,000 barrels of the total entered into bond.

December crude runs averaged 3,539,000 barrels a day, an increase of 27,000 barrels over November and 125,000 barrels above the average for December, 1939, the bureau reported. Total runs for the month were 109,703,000 barrels.

Receipts of crude at refineries for the month were 109,293,000 barrels, of which 104,560,000 barrels was domestic and 4,733,000 barrels foreign oil, the report showed. The daily average of receipts was 3,526,000 barrels, of which 3,373,000 barrels was domestic and 153,000 barrels foreign. Fuel and losses were 104,000 barrels, an average of 3000 barrels daily.

For the year, the bureau announced, receipts at refineries included 768,734,000 barrels moving intrastate, an average of 2,100,000 barrels a day; and 487,577,000 barrels moving interstate, an average of 1,332,000 barrels, in addition to foreign oil received. During the year, the entry of foreign oil increased steadily, the December average being slightly more than double that in the corresponding month in 1939.

Stocks of crude at refineries at the close of the year were 52,448,000 barrels, the report showed.

War Caused 47 Percent Reduction in U. S. Oil Exports

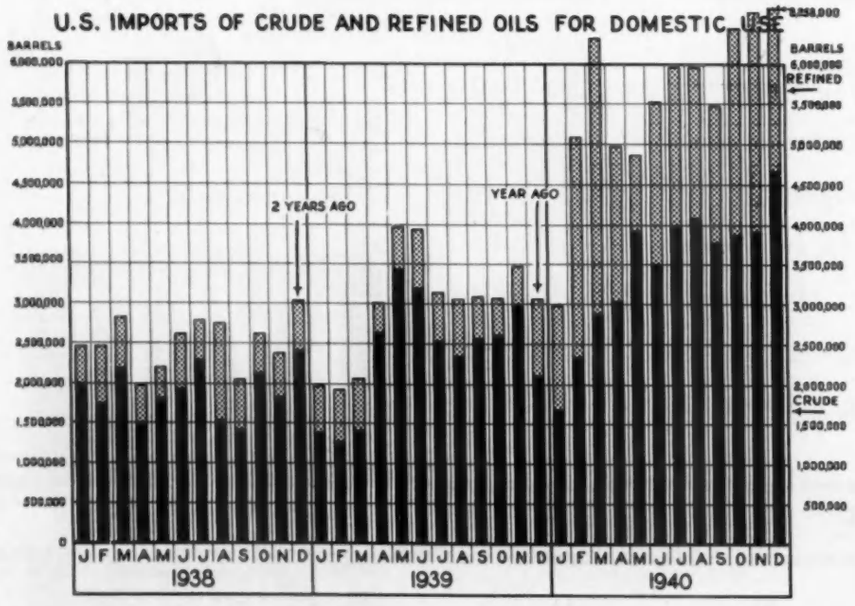
ITEM	YEAR 1939	YEAR 1940	Percent Change	MONTH OF DECEMBER 1939	MONTH OF DECEMBER 1940	Percent Change
Crude Oil	72,076,000	51,600,000	— 28.4	4,656,000	2,074,000	— 55.5
Products:						
*Motor Fuel	44,638,000	25,107,000	— 43.8	3,136,000	1,983,000	— 36.8
Aviation Gasoline (included above)	4,234,000	4,295,000	+ 1.4	372,000	497,000†	+ 33.6
Kerosene	8,241,000	3,374,000	— 59.1	652,000	116,000	— 82.2
Gas Oil and Distillate	32,020,000	19,172,000	— 40.1	1,998,000	953,000	— 52.3
Residual Fuel Oil	17,485,000	16,077,000	— 8.1	1,334,000	913,000	— 31.6
Lubricants	11,881,000	10,494,000	— 11.7	1,310,000	588,000	— 55.1
Wax (pounds)	232,644,000	190,065,000	— 18.3	14,603,000	8,778,000	— 39.9
Coke (short tons)	286,200	302,100	+ 5.6	12,600	25,700	+ 104.0
Asphalt (short tons)	42,400	296,800	+ 600.0	2,200	28,700	+1204.5
Miscellaneous Oils	123,000	944,000	+ 667.5	14,000	47,000	+ 235.7
‡Total Refined Products	116,883,000	78,989,000	— 32.4	8,557,000	4,917,000§	— 42.5
Total Crude and Products	188,959,000	130,589,000	— 30.9	13,213,000	6,991,000§	— 47.1

* Includes benzol, 1,000 barrels in December, 1940. † Includes 77,000 barrels anti-knock compounds. ‡ Not the sum of the above figures, some of which do not indicate barrels. § Exclusive of 12,000 barrels exported from non-contiguous territories but inclusive of 457,000 barrels shipped from United States to territories.

Oil Imports Nearly Double In 1940

Figures indicate barrels and are from Bureau of Mines.

MONTH	Crude Oil	Refined Products	Total
February:			
Feb., 1939	1,266,000	654,000	1,920,000
Feb., 1940	2,343,000	2,731,000	5,074,000
Change	+85.0%	+320.0%	+164.0%
March:			
Mar., 1939	1,404,000	659,000	2,063,000
Mar., 1940	2,895,000	3,410,000	6,305,000
Change	+106.2%	+417.4%	+205.6%
April:			
April, 1939	2,648,000	366,000	3,014,000
April, 1940	3,041,000	1,948,000	4,989,000
Change	+14.8%	+432.0%	+65.5%
May:			
May, 1939	3,434,000	529,000	3,963,000
May, 1940	3,921,000	934,000	4,855,000
Change	+14.2%	+76.5%	+22.5%
June:			
June, 1939	3,196,000	750,000	3,946,000
June, 1940	3,488,000	2,056,000	5,544,000
Change	+9.1%	+174.1%	+40.5%
July:			
July, 1939	2,539,000	608,000	3,147,000
July, 1940	3,981,000	2,000,000	5,981,000
Change	+56.8%	+228.9%	+90.0%
August:			
Aug., 1939	2,346,000	717,000	3,063,000
Aug., 1940	4,074,000	1,898,000	5,972,000
Change	+73.7%	+164.7%	+95.0%
September:			
Sept., 1939	2,553,000	541,000	3,094,000
Sept., 1940	3,772,000	1,712,000	5,484,000
Change	+47.1%	+216.5%	+77.2%
October:			
Oct., 1939	2,605,000	1,741,000	3,965,000
Oct., 1940	3,741,000	3,122,000	6,863,000
Change	+43.6%	+79.3%	+73.1%
November:			
Nov., 1939	2,984,000	482,000	3,466,000
Nov., 1940	3,932,000	2,861,000	6,793,000
Change	—31.8%	+493.6%	+96.0%
December:			
Dec., 1939	2,099,000	958,000	3,057,000
Dec., 1940	4,673,000	3,585,000	8,258,000
Change	+55.1%	+274.2%	+170.1%
Year:			
1939	28,447,000	7,298,000	35,745,000
1940	41,525,000	27,498,000	69,023,000
Change	+46.0%	+276.8%	+93.1%


U.S. IMPORTS OF CRUDE AND REFINED OILS FOR DOMESTIC USE
BARRELS
REFINED
CRUDE
2 YEARS AGO
YEAR AGO
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1938
1939
1940

Source: Bureau of Mines

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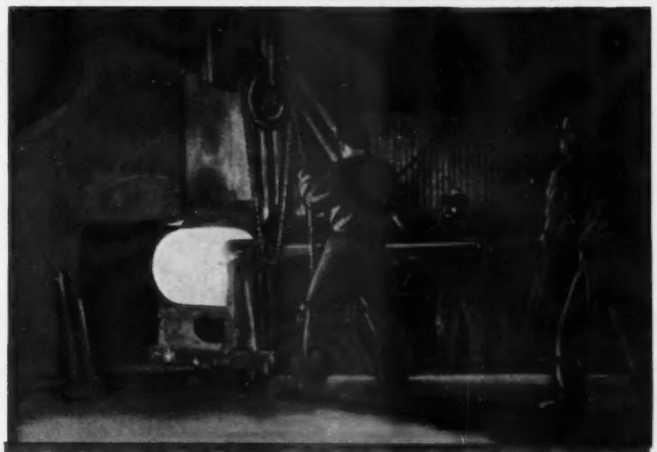

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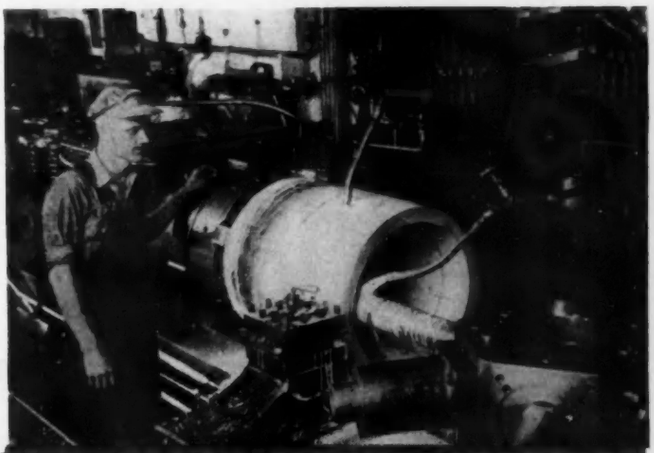

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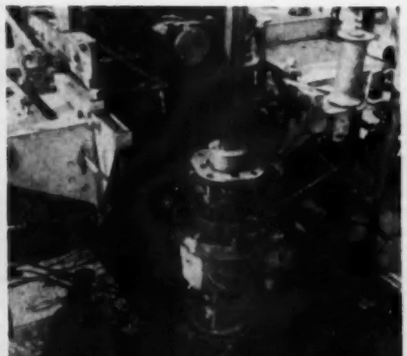

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HIGHLIGHTS IN THE WEEK'S NEWS

Washington

Trade Body Asks Defense Investigation for Industry

Broad investigation of the oil industry as the basis for developing a definite national policy dealing with production and distribution that would fit into the defense program was recommended to the Temporary National Economic Committee last week by James A. Horton, chief examiner of the Federal Trade Commission.

Horton offered his suggestion during testimony on efforts of the commission to eliminate restraints of trade, in the course of which he expressed an opinion that the number of price-fixing cases will increase materially under the defense program.

Under the present system of enforcement, each case is investigated and dealt with separately, he said, whereas it might be possible to reduce the number of complaints and deal more effectively with the situation by broad investigations of entire industries.

"The commission, from time to time and as the necessity arises, could initiate investigations of certain industries which would be greatly in the interest of the public," the chief examiner explained. "I can refer specifically to the oil industry, which as we all know is impressed with a deep public interest.

Industry Flayed for Sales To Warring Fascist Nations

Denouncing industrialists who sell to both sides in the European war in the face of President Roosevelt's declared determination to aid democracies in resisting invasion at the hands of aggressor nations, Representative John M. Coffee last week told the House of Representatives that "the oil monopoly plays no favorites."

"We have been led to believe that our country should, and is, standing as a unit in refusing to do business with Fascist governments, and in aiding democracies at all times," he commented.

"Right now Standard Oil subsidiaries are carrying gasoline to both sides in the European war. They carry supplies to Britain, to Japan and to Spain. In the latter country, they are reshipping to Italy and Germany; yet we are told that there is an embargo on the exportation of gasoline, scrap iron and material of war to Japan."

The Washington congressman sarcastically called attention to the inconsistency of the administration in refusing to make a loan to Fascist Spain, but lending money to Argentina while that country loaned an equivalent amount of money or merchandise to Spain, and in lending $100,000,000 to China to enable the continuance of the fight against Japan while continuing to buy quantities of Japanese products annually.

"The Standard Oil tanker 'Libby' recently made a trip to Cartagena in the United States of Colombia, where she loaded up with oil which she took to Freetown, West Africa, for British use," he declared. "Having pumped out this oil at its destination, the 'Libby' raced back to Venezuela, where at Carapito she loaded another cargo, which she took to the historic and beautiful harbor or Teneriffe in the Canary Islands, a possession of the Spanish Fascist state. Here the cargo of oil was transferred to tankers, one flying the Nazi flag of Germany and the other the emblem of Fascist Italy.

"Teneriffe in the Canary Islands is a very busy port these days. Standard Oil tankers are pulling in and out in regular order. When the W. H. Libby departed from that port, there were eight Italian and Germany tankers awaiting the opportunity to load cargoes sent to them from West Indian and South African oil companies, through the courtesy of the American oil companies operating ships under foreign flags and foreign names."

While trainees are being drafted for $21 a month for the first four months of service, living in ill-heated tents in the winter cold, Mr. Coffee asserted, "we see 'paytriotic' industrialists fostering the shoddy business of selling war materials to our potential enemies."

"Now is the time for everyone to make a corresponding sacrifice," he said. "Let our wealthy businessmen and industrialists set the example."

News Index

General:

Allowables 53
Associations 54
Pipe Lines 56
Washington 53

Markets-Statistics 76

Men in News 97

World-Wide Developments ... 56

U. S. Field Operations:

Arkansas 89
California 90
Completions 91
East Texas 85
Illinois 79
Kansas 80
Louisiana Coast 88
Michigan 90
Mississippi 89
North Louisiana 89
North Texas 84
Oklahoma 79
Southeastern States 89
Southwest Texas 86
Texas Gulf Coast 87
West Texas 80
Wildcat Development 95

Allowables

Bureau Ups March Demand 26,600 Barrels Over February

Market demand for petroleum products next month will require production of domestic crude oil at a rate of 3,655,500 barrels a day, it was forecast February 20 by the United States Bureau of Mines.

The March forecast is 26,600 barrels higher than the estimated demand for this month, but 14,900 barrels lower than the actual demand in March, 1940, when a heating oil shortage caused by the extremely cold winter resulted in large runs of crude oil to stills, it was pointed out.

Analysis of the bureau's forecasts for the past 15 months, however, shows that the March figure is the highest since that for August, 1940, and there is little doubt that oil production in the United States is heading toward new high levels.

The bureau reported that daily average crude-oil production during the four weeks, January 11 to February 8, was 3,605,000 barrels, and runs to stills 3,609,000 barrels, while during the period domestic crude stocks increased an average of 48,000 barrels daily, indicating a demand of 3,557,000 barrels.

"Current data indicate an increase in the total demand for all oils that verifies the bureau's long-term estimates as published in the January forecast report," it was commented. "As pointed out at that time, only a moderate rate of increase in total demand for the first quarter of 1941 could be expected because of the exceptionally high demand in the same period of 1940.

"An analysis of current data, as compared with the same period last year, indicates that the domestic demand for motor fuel may be greater than anticipated, that the domestic demand for distillate fuel oils will be no greater, and possibly less, than the abnormal demand for the first quarter of last year, when a gain of 25 percent over 1939 was recorded; that the domestic demand for residual fuel oils will show a moderate increase over the exceptionally high figures of last year; and that the total volume of exports has declined,

Bureau of Mines Forecast of Crude Oil Demand for March

State	Forecast March 1941	Forecast February, 1941
Texas	1,327,400	1,312,900
California	596,400	595,700
Oklahoma	437,400	442,500
Illinois	335,200	342,100
Louisiana	291,300	288,600
Kansas	194,200	193,200
New Mexico	103,900	100,700
Wyoming	83,900	74,600
Arkansas	69,700	66,100
Pennsylvania	48,100	50,000
Michigan	47,400	47,500
Indiana	22,600	22,500
Montana	21,900	20,000
Mississippi	20,300	16,100
Kentucky	14,200	15,400
New York	13,000	12,900
West Virginia	11,100	10,900
Ohio	10,100	10,100
Colorado	3,900	3,900
Nebraska	3,200	3,200
	3,655,500	3,628,900

while imports of crude and residual fuel have increased substantially."

Motor Demand Up 8 Percent

Domestic demand for motor fuel in March is estimated as 48,200,000 barrels, or eight percent above the actual demand in the same month last year. The estimate for exports, based upon forecasts by the principal exporters, is 2,000,000 barrels, compared with an actual export of 1,983,000 barrels in December and 2,265,000 barrels in March, 1940.

Stocks of finished and unfinished gasoline amounted to 84,809,000 barrels on December 31, or about 1,500,000 barrels higher than they were at the end of 1939, it was pointed out. Statistics of the American Petroleum Institute indicate an increase of about 6,900,000 barrels during January, which would bring them to near 91,300,000 barrels as of January 31. The bureau estimates a further increase of 2,600,000 barrels during March which, together with the estimated February increase, if adhered to, would make the March 31 inventory of finished and unfinished stocks approximately 100,000,000 barrels.

Benzol production and direct sales of natural gasoline are estimated as 1,600,000 barrels, which would give an indicated refinery production of 51,200,000 barrels, which the bureau distributed among the several districts as follows:

East Coast, 6,760,000 barrels; Appalachian, 1,930,000 barrels; Indiana-Illinois, 11,250,000 barrels; Oklahoma, 2,690,000 barrels; Kansas-Missouri, 2,840,000 barrels; Inland Texas, 3,420,000 barrels; Texas Gulf Coast, 12,220,000 barrels; Louisiana Gulf Coast, 1,410,000 barrels; Inland Louisiana-Arkansas, 910,000 barrels; Rocky Mountain, 1,390,000 barrels; California, 6,380,000 barrels.

Natural gasoline to be blended at refineries is estimated as six percent of the total refinery production, or 3,070,000 barrels. The yield of straight-run and cracked gasoline is estimated as 43 percent which, applied to the production of 48,130,000 barrels, gives crude runs of 111,920,000 barrels, or 3,610,300 barrels daily.

The estimate for foreign crude runs to stills is 3,900,000 barrels, compared with actual runs of 2,348,000 barrels in March of last year. The estimate for crude-oil exports, in keeping with a less optimistic outlook by the principal exporters, has been lowered to 3,200,000 barrels, compared with actual exports of 4,046,000 barrels last year, Crude oil to be used as fuel and losses is estimated as 2,100,000 barrels.

On the basis of these estimates, the total demand for domestic crude oil in March is placed by the bureau at 113,320,000 barrels, or 3,655,500 barrels a day, which it has allocated among the several states as shown in an accompanying table.

Michigan to Adopt New Oil Proration Method

Under consideration for several months, definite action will be taken March 10 on proposals to revamp methods of proration in Michigan, P. J. Hoffmaster, state supervisor of wells, announced last week.

The present proration method, instituted in 1939 when the conservation statute was passed, is on a lease-wide basis, regardles of the size of the tract or the number of wells. Either a per-well allowable or a unit plan, limiting the size of the lease for proration purposes, will be adopted.

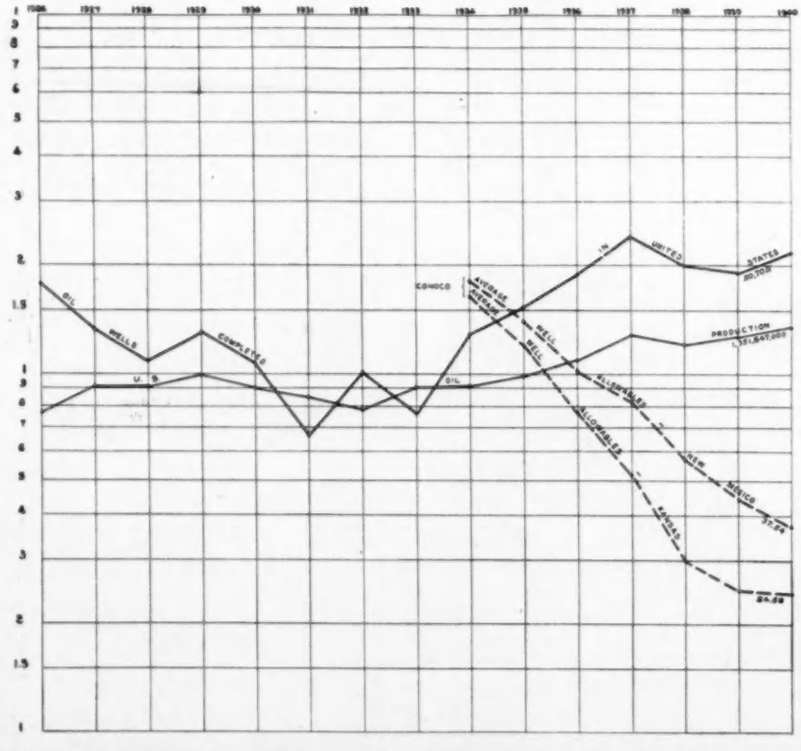

Chart showing trend of well allowables in New Mexico and Kansas against trend in total number of oil wells completed and crude oil production of the United States. Allowables are cited to emphasize the magnitude of the decline rather than as evidence of its occurrence.

Associations

East Texas A.P.I. Has Session On Plugging and Pumping

W. H. Wiginton, The Atlantic Refining Company, Longview, read a paper on "Recent Trends and Success of Plug-Back Work in East Texas" before the East Texas chapter of the American Petroleum Institute's Division of Production last week at Kilgore. A comprehensive abstract appears on Page 26 of this issue. Formal discussion was presented by R. M. Bass, of Robert M. Bass, Inc.

P. D. Cornelius, district manager for Kobe, Incorporated, read a paper on "Applications of Hydraulic Well Pumping in the East Texas Field." Use of down-the-well hydraulically operated pumping units is comparatively new to the East Texas field. Discussion of the paper was presented by N. N. Jones, Humble Oil & Refining Company.

Tulsa Geologists Hold Round Table on Well Spacing

Denial that wider well spacing was the solution to declining allowables was voiced during a round table discussion of well spacing before the Tulsa Geological Society last week by S. K. Clark, assistant chief geologist for Continental Oil Company, Ponca City.

Clark made it clear that he was not denying that allowables have declined, and with that decline there was a decline in investments in well drilling.

To refute an argument that wide spacing will reduce the rate of development, Clark declared that a general program of wider spacing in Kansas stimulated well drilling.

"If the cure (wide spacing) had any merit, its application should begin showing benefits at the outset," Clark said. "As a matter of fact, the experience demonstrates that benefits flattened out.

See Chart, Columns 1-2

If it is true that declining allowables are due to excessive rate of development, it follows that stability in oil development is not being effectively maintained. When rate of development is attempted to be controlled, we run up against the argument that nothing can be done about it. But if we recognize that controlled rate of development must come, then something can be done."

Dr. Russell S. Knappen, assistant to the vice president of Gulf Oil Corporation, challenged Clark's reference to the Kansas situation, maintaining that the stimulated drilling was to clean up pools already discovered, and that there currently was a decline "resulting in only half as many wells."

Ivan S. Salnikov, chief engineer for The Carter Oil Company, declared that rate of development was predicated upon rate of finding, and that spacing had nothing to do with the question.

Thomas Brownfield, head of the scouting and statistical departments of The Carter Oil Company, pointed out that an operator believing in wider spacing may develop on that plan if he wishes, and suggested that after "four or five years we would be back in the same boat where we started."

"Ultimately, all these locations will

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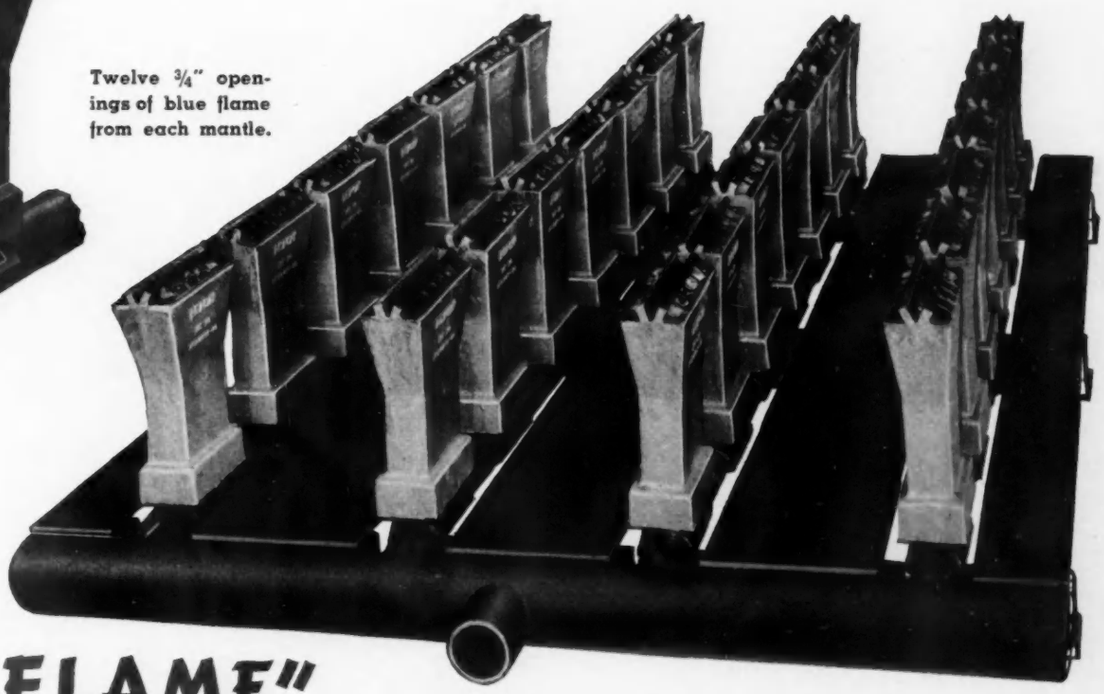

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HOUSTON, TEXAS, U. S. A.

be drilled anyway," Brownfield said. "When these wells were drilled, it would have the same effect. This would be just a stop-gap."

A. W. Walker, geologist for Stanolind Oil & Gas Company, remarked that fields have to be developed "on some program that will pay out," and added that "10-acre spacing is good for drilling contractors, not good for operators."

Phil Baker, engineer for The Carter Oil Company, conceded that spacing had nothing to do with rate of recovery. Twenty-acre spacing would adequately drain the East Texas field, he said.

World-Wide Developments

Building Road for Wildcat On Barco Concession

Columbian Petroleum Company was building road to location for a new wildcat test on the South Sardinata structure, six or seven kilometers west of the Petrolia field onthe Barco concession. The structure, located by geophysics, has on it two highs the south one of which will be drilled as soon as the road is finished. It will be a test to Tertiary. Drilling should begin in about two months.

The company's Socuavo 1 was setting 9⅜-inch casing at 7450 feet, top of the Cretaceous, while No. 2, at Tree Bocas, formerly reported as drilling, was awaiting completion of road to location. A new heavy rig will be used on this well.

Reports from Colombia indicate the company will shortly make greater use of a road paralleling the SOGAC pipe line from the coast to Petrolia and other Barco fields to bring in materials. The road is reported to be in fair shape, and is being improved. Formerly, much of the materials for Barco tests were brought in by way of Lake Maracaibo, then up the Catatumba River to Encontradas and by other rivers, some of them very low in the dry season, to various locations on the concession.

Ireland Cuts Gasoline Allowances 75 Percent

Gasoline rations in Eire have been cut by 75 percent.

The minister for supplies has issued an order by which the value of the unit of each coupon has been reduced to a quarter of a gallon, this reduction applying to coupons of all kinds. The extra allowance of 50 percent which has hitherto been granted for private cars has been withdrawn.

England May Pool Gasoline Tank Trucks

England's tank trucks transporting gasoline may be pooled, it has been indicated following a conference between the Ministry of Transport and the Petroleum Board.

Oil Personalities . . .

JAMES WAINWRIGHT FLANAGAN

James Wainwright Flanagan, president of Andian National Corporation and director of International Petroleum Company, Toronto, Canada, has been made an honorary colonel of the Irish Regiment of Canada, the first American citizen to be accorded this honor.

The 69-year-old Texas-born oil man is best known for his construction of a 335-mile oil pipe line from Barranca-Bermeja through the swamps of Colombia to a terminal at Cartagena. The project was completed in 1926, and during the period Flanagan was vice president and general manager of Andian National Corporation, succeeding to its presidency in 1925.

In his youth, Flanagan enlisted in the army of General Maxim Gomez and took part in Cuba's fight for independence. He attained the rank of colonel in 18 months, and when the United States entered the Spanish-American war he transferred to the American Army and became a captain.

He was given the Honour of the Order of St. Gregory by Pope Pius XI in 1926; received the Cross of Boyaca from the President of Colombia in 1933, and was made an honorary citizen of Cartagena in 1934. He has resided in Colombia for the past 10 years.

One of the best-loved American oil men ever to have made his home in Colombia, James Wainwright Flanagan recently became the first American citizen to be made an honorary colonel in the Irish Regiment of Canada. Born in Henderson, Texas, he now resides in Toronto, Canada.

Pipe Lines

Pan American Line Explosion Kills Three Construction Men

While being operated and on the line for regular deliveries, although construction was not yet completed by the contractor, the Livingston station of the Pan American Pipe Line Company's East Texas line was the scene of a fire which took the lives of three of the men employed by the contractor.

Victims were J. M. Holt, 35, construction foreman, Shreveport; A. M. Nichols, welder, Tulsa, and Elmo Lawrence, 21, Kilgore.

The cause of the break which resulted in the fire is under investigation by the pipe line and other authorities, with their findings as yet unannounced.

Precautionary measures were prescribed and close supervision of all operating units carried out during the operation of the new equipment. Due to the vigilance being exercised, the station men were able to shut down the pumps and close the main line promptly, effecting the saving of all equipment located within the station buildings.

In the feature article describing the Pan American Pipe Line in THE OIL WEEKLY, February 17, reference was made to "marine-type" diesels. The engines used on this line are all six-cylinder, 13x16-inch, mechanical-injection stationary engines, delivering 400 horsepower at 300 revolutions per minute.

Magnolia Provides Connection With Talco-Shreveport Line

Magnolia Pipe Line Company is building a 5.7-mile 8-inch extension line from Faulkner booster station, Panola County, Texas, on its Arkansas-Beaumont carrier to connect with Humble Pipe Line Company's Talco-Shreveport trunk line. This hookup will enable Magnolia Pipe Line Company to accept delivery of Magnolia Petroleum Company's production in the Talco field, currently averaging 1950 barrels daily from 82 wells. Humble Pipe Line Company delivers the low-gravity oil produced at Talco, and more recently at Hawkins, to Standard Oil Company of Louisiana's Moore station and tank farm, near Shreveport.

Build Short Oil Line in Pecos County, West Texas

Midland Shasta Pipe Line Company, a unit of Shasta Oil Company, has constructed an 8½-mile 2-inch crude line from the latter's shallow oil properties in the Walker pool, Pecos County, West Texas, to Shell Pipe Line Corporation's trunk line in the Taylor Link pool.

East Texas Wells Found Unable to Produce Allowables

Periodic checkup on all edge leases in the East Texas field by the Texas Railroad Commission's engineering staff to ferret out sub-marginal producers is revealing an unusually large volume of wells that can't produce their assigned allowable. The survey is being conducted on all leases, irrespective of ownership, and has resulted in the monthly crude runs of one pipe line company being cut 800 barrels.

STAMINA

Charlemagne Crossing the Alps in 773

STAMINA... the strength to carry on in the face of all the obstacles a relentless foe can impose. From Charlemagne to Churchill, it has ever been the mark of a courageous people — and the strongest assurance of ultimate victory. Gaso salutes the stamina of the British in their battle for life, confidently looks to the stamina of Americans to carry us through the dangers that beset us, and submits that the stamina of Gaso Pumps is, more than any other factor, the reason for their supremacy in oil industry service.... Gaso Pump & Burner Mfg. Co., Tulsa, Okla. Export Office: 149 Broadway, New York. Houston: 2108 Tangley. Los Angeles: Service Oil Field Supply Co., 5333 S. Riverside Drive.

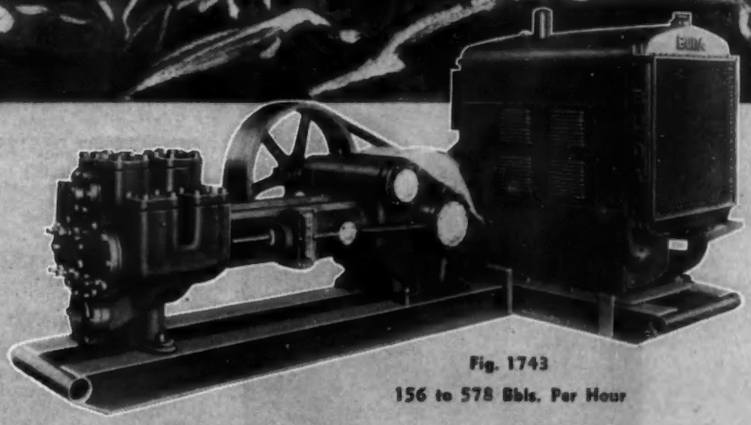

Fig. 1743
156 to 578 Bbls. Per Hour

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for every oil industry need

GEORGE A. HILL, JR.

SAM HOUSTON JONES

W. E. HEROY

A. P. I. Southwestern District Program

THREE speakers on general-interest subjects have been scheduled to supplement a highly informative technical program for the spring meeting of the Southwestern District, American Petroleum Institute's Division of Production, to be held Thursday and Friday, February 27-28 at Shreveport.

Sam Houston Jones, governor of Louisiana, Baton Rouge, and George A. Hill, Jr., President of Houston Oil Company of Texas, Houston, will speak on subjects yet to be announced. W. E. Heroy, president of Pilgrim Exploration Company, Houston, will discuss "Oil and the European War." All will speak at the Friday morning session.

L. A. OGDEN
Chairman, Southwestern District

Features of the entertainment program include a stag buffet supper Thursday evening at the Shreveport Country Club, and a dinner-dance Friday evening at the Washington-Youree Hotel. Special plans are being arranged for entertainment of visiting ladies.

The complete program follows:

THURSDAY MORNING, FEBRUARY 27

Presiding:
E. P. Hayes, The Texas Company, Houston.

Opening Remarks:
L. A. Ogden, The Pure Oil Company, Fort Worth, district chairman.

Chapter Activities:
By officers of Southwestern District chapters.

Removal of Paraffin by Electrical Heating in the Texas Panhandle:
Benton Turner, Los Angeles, and Chas. R. Rider, Dallas, both of Drilling & Exploration Company.

Prevention of Corrosion of Steel Pipe Lines by Oil Well Brines:
William Stericker, Philadelphia Quartz Company, Philadelphia.

THURSDAY AFTERNOON, FEBRUARY 27

Presiding:
S. E. Buckley, Humble Oil & Refining Company, Houston.

Practical Economics of Cycling:
B. B. Boatright and P. C. Dixon, Foran, Boatright & Dixon, Houston.

Field Tests for Cycling Prospects:
E. O. Buck, consulting engineer, Houston.

Application of Electrical Models to Study of Recycling Operations in Gas Distillate Fields:
William Hurst and G. M. McCarthy, Humble Oil & Refining Company, Houston.

THURSDAY EVENING, FEBRUARY 27

Stag Buffet Supper:
Shreveport Country Club.

FRIDAY MORNING, FEBRUARY 28

Presiding:
L. A. Ogden.

Oil and the European War:
W. B. Heroy, Pilgrim Exploration Company, Houston.

Address:
George A. Hill, Jr., Houston Oil Company of Texas, Houston.

Address:
Sam Jones, Governor of Louisiana.

FRIDAY AFTERNOON, FEBRUARY 28

Presiding:
W. E. Schoeneck, The Ohio Oil Company, Shreveport.

A Preliminary Survey of the Heaving Shale Problem:
H. H. Power and C. R. Houssiere, Jr., The University of Texas, Austin.

Introduction to a Technique for Determining Optimum Spacing of Oil Wells:
Park J. Jones, petroleum engineer, Fort Worth.

Energy Requirements for Pumping Oil Wells:
S. B. Sargent, Jr., Sargent Engineering Corporation, Huntington Park, California.

Election of Officers and Advisory Committee.

FRIDAY EVENING, FEBRUARY 28

Dinner-Dance
Crystal ball room, Washington-Youree Hotel.

E. P. HAYES
Chairman, Program Committee

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DALLAS, TEXAS

Economics

[*Continued from page 20*]

paper was summarized by L. F. Terry, chairman at the meeting, and copies of the paper were distributed.

Among the other economic papers, that on "The Outlook for Petroleum Prospecting" was particularly interesting, because of its highly practical and fascinating nature. The author, E. DeGolyer, of Dallas, geologist and geophysicist, and former president of the AIME, stated that the petroleum industry appeared to be by now in the latter stages of using up the established techniques for finding new oil fields, and that it would have to go back to random drilling unless new, effective exploration methods were established.

Tanker shipments are the most important in total transportation of oil, stated Mr. Holman in his comprehensive discussion of world transportation of petroleum; and they also are subject to most readjustment in war. Various means of maintaining an adequate United States tanker balance were set forth, including construction of additional tankers, which is under way.

Abstracts of the papers follow:

Petroleum Transportation in a World at War

By Eugene Holman,

Director, Standard Oil Company (New Jersey), New York, New York

The petroleum industry is able to supply the world's present needs but also to meet a considerable increase in demand. From an overall worldwide standpoint, it may be considered that sufficient reserve capacity exists to cover amply war-time variations in requirements. The bulk of the producing and refining capacity is advantageously located with respect to non-vulnerability to military attack.

On the other hand this very isolation of petroleum sources also creates an important problem of transportation. In meeting the problem the oil industry has developed large-scale transportation by pipe line, tanker, barge, tank car and tank truck. Although little more than half the petroleum is handled by tankers, the average distance of tanker movements, worldwide, is about 3000 miles. Not only are tanker shipments the most important in total transportation accomplished but they are also subject to most readjustment in war. Short-haul transportation is relatively little affected. Under normal conditions some surplus of tanker tonnage exists for Great Britain. The United States, Italy and Japan are in fairly close balance. France and Germany are deficient, Norway and, to a lesser extent, Panama, are primarily in the shipping business to cover tonnage shortages for the rest of the world.

Since the outbreak of the war Germany, which formerly depended heavily on tanker transportation, has had to find other avenues of oil supply. The Mediterranean tanker routes have been sharply constricted. Some oil from Russia has been first moved by rail or barge to Baltic ports and transshipped to tanker to Germany. To some extent special products have been moved from Russia across the Black sea for movement by rail or barge on into Germany. Increased use of this route would be a possibility if Rumanian sources were shut off. Any other Russian shipments have been through the new inland waterway routes such as the Dnieper-Bug canal, or by tank car. The major German imports from Rumania have been taken partly by inland waterway up the Danube and partly by rail. Recent acquisitions of tank car and barge capacities of Continental Europe, and construction of two new pipe lines from Rumania to the Danube make it appear that the Germans are well on the way to securing most of Rumania's exportable production.

Italy, prior to the war almost entirely dependent on tanker transportation for imports, now finds supplies limited to stocks on hand. The small Albanian production is in jeopardy. Rail shipments from Rumania are small and dependent on what Germany will allow to go to Italy.

Japan's supply lines so far have not been disrupted. That country has a sizable tanker fleet able to meet its normal import needs. If Japan were to enter the war, its ability to obtain petroleum supplies would be a serious problem. It is unlikely that shipments by tanker across the Pacific would continue, and there is doubt that strong convoys could be organized to protect movements from the Netherlands East Indies, even if supplies could be secured there.

As for Great Britain, British tanker routes have been dislocated by war in the Mediterranean and the need of moving in convoys from other sources. The long journey by Cape of Good Hope for movements from the Near and Far East has become a necessity. Damage done to shipping by planes, raiders and submarines has seriously interfered with British supplies. The British tanker balance today must be comparatively close. The adequacy of the British tanker fleet will depend on the duration of the war and the future rate of destruction, although offsetting these factors will be the possibility of development of shorter time for repairs, quicker turn-arounds and better convoy service.

Normal transportation needs of foreign non-belligerents are somewhat greater than the capacity of what may be considered "free" tonnage, and must be met partially by chartering tonnage controlled by the British or the United States. Tonnage, so far, has been available. The future availability of tonnage will reflect British and American situations.

With respect to the United States, it has been the practice for tanker operations to carry a small surplus of vessels. Since the war several conditions have created periods when the balance between tanker availability and needs has been very tight. These conditions are: naval requisitioning of specially designed high-speed tankers, increases in product requirements and transportation therefor by national defense programs, an increasingly greater seasonal peak in total East Coast requirements occasioned by rapid growth of the heating-oil business in the eastern states, and the increasing age of American vessels, creating off-time for major repairs.

The means of maintaining an adequate United States tanker balance are: construction of additional tankers, which has already got under way; maintenance of old tankers in service through extensive repairs, a possible but high-cost method; supplementing tanker movements with other forms of transportation; substitution of shorter hauls where practicable, such as substitution of the Gulf-to-East-Coast voyage for the longer California-to-Eastern haul; and the smoothing out of seasonal peaks, as by employing otherwise idle tankers during the off-season in increasing the accumulation at terminals. Several companies have declared they would build additional tankage along the eastern seaboard during the coming year.

The Validity of Competition in a Natural Resource Industry

By John D. Gill,

The Atlantic Refining Company, Philadelphia, Pennsylvania

The question before us is whether the principle and practice of competition can be abandoned in favor of the practice of some other principle without injury to democracy and our economic development. The author's answer is "No." Encroachments on individual freedom in a competitive system tends to put a brake on material progress and defeats the purpose of the abrogation of rights.

J. D. Gill

The driving, progressive conduct of operators in competitive, non-natural-resource industries is the same force which provides validity to competition in natural-resource industries. It has been argued that competition in the petroleum industry should be eliminated in favor of some form of control because waste has occurred in the industry because of competition. True, there have been some wastes, but who could show that for an equal rate of development these wastes would not have occurred had there been government control throughout the life of the industry?

Suppose there had been governmental control from the start. What wastes would have been avoided? What would be the present size of the industry? How would a government board have faced the technical and economic problems? When and to what extent would the board have permitted new methods in production and refining? Other questions could be asked.

A controlling bureau or board appears most effective in providing regulation only when it attempts to regulate that which has been developed and when hindsight can be used as a basis for standardizing current practices. It

cannot foresee how the operation of the industry should proceed.

The persistence of demands for non-competition and government control thrives on fragmentary and often illogical concepts. For one thing, the degree to which physical waste has occurred has been magnified. Also, extreme conservationists fail to consider the trend of developments more and more toward the production of materials from virtually illimitable sources, such as the various synthetic methods. Finally, the relation between the oil industry and the entire economy has been almost completely ignored. The notable growth of the American economy has been made possible by the rapid exploitation of petroleum.

The Outlook for Petroleum Prospecting

By E. DeGolyer,

Geologist, Geophysicist, and Oil Operator, Dallas, Texas

(Following is a summary of a discussion of the above subject by Mr. DeGolyer, based on notes taken on his talk at the meeting. No manuscript was available.)

For the next several years, no material change in rates of oil-field discoveries is in prospect, although in geophysics there will probably occur henceforth a falling off both in actual work and in results.

E. DeGolyer

Methods of finding oil have evolved in cycles, from discovering fields through gas bubbles, to refraction seismograph exploration, to reflection seismograph shooting. Each method, with exception of that now in use (reflection shooting), eventually has been largely "used up," or exploited toward the point of exhaustion of possibilities; and thereupon has given way to a new and more effective method. But meanwhile, the whole series of cycles is being used up.

The industry now is in the "using up" stage of reflection seismograph exploration, and in this cycle appears to be past the crest and on the down-hill slope; although it is conjectural what will yet result from reflection work.

Furthermore, the industry appears to be in the latter part of all the techniques—well along in the using up of all the exploration cycles.

At the beginning of this year there were probably around 190 reflection crews at work in the United States, and that number compared with 250 in the field 18 months earlier.

Being now in the latter stage of the technique of reflection work, the industry must go back to the old stand-by, random drilling, unless new, effective methods can be established. New methods offering interesting possibilities, include the soil analysis and related surveys, in which the pioneers in those fields seek to find oil accumulations through leakages of hydrocarbon gases upward into the subsurface or surface strata above the oil reservoirs.

Considerable success has been obtained also, particularly in California, in finding stratigraphic traps through use of surface geology. But in that and some other methods of prospecting, more drilling will be needed than required in development of reflection prospects; and consequently, less expensive drilling will be needed, as for instance, perhaps, more extensive use of "slim" holes instead of the larger holes which can serve both as prospecting and exploitation wells. In most other forms of mining, relatively cheap prospecting holes are used.

(In conclusion, DeGolyer stressed the fact that rates of finding oil are not proportional to effort, because of the element of luck, which may greatly vary results. Accordingly, he declared, it is hazardous to attempt any forecast as to probable discoveries, as demonstrated by the fact that discovery of the enormous East Texas field would have ruined any reasonable forecast for the period in which it was made.)

Continuation of leasing and geophysical work in the Dakotas and the Great Plains country will be an interesting development in oil prospecting, DeGolyer added.

World Production of Petroleum Substitutes

By V. R. Garfias
and
R. V. Whetsel
Cities Service Company, New York, New York

World production in 1939 of petroleum substitutes, of which 97 percent constituted direct substitutes for motor fuel, amounted to about 108,000,000 barrels, or 300,000 barrels daily, equivalent to aggregate crude oil output in that year in Rumania, Mexico, and Colombia. The production figures also largely represented consumption.

The United States accounted for 57,336,000 barrels, or 53 percent of the above world total, through its large output of natural gasoline, which amounted to 49,896,000 barrels. (Benzol output was 2,440,000 barrels and that of liquid gas, largely propane-butane, was 5,000,000 barrels.)

R. V. Whetsel

Stimulated by war, Germany's production of petroleum substitutes, largely from coal, rose in 1939 to 20,000,000 barrels.

Since the war began, substitutes have become increasingly important in meeting Europe's deficiency of petroleum, although synthetic plants and oil storage have been systematically bombed.

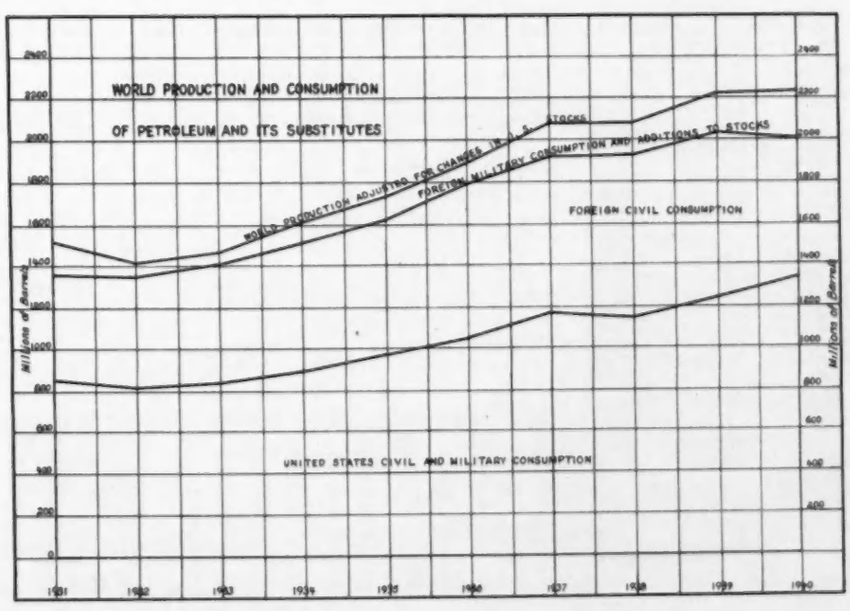
Natural gasoline in many cases should be considered a petroleum product rather than a substitute. The United States produces nearly 80 percent of the world's natural gasoline, and Canada ranks second.

Propane and butane may be liquefied and used as motor fuel or as domestic fuel, and liquid gas is obtained also as a by-product in manufacture of synthetic gasoline from coal. The United States produces 5,000,000 barrels annually of liquid gas, most of which would substitute for motor fuel. Methane from wells in Italy is used as fuel in motor vehicles.

Gasoline and benzol are the principal petroleum substitutes made from coal. Kerosene, diesel oil, fuel oils, and limited amounts of lubricants also are commercially produced from coal.

Manufactured gas from coal is used as motor fuel in Germany, England, and Italy, being compressed into lightweight cylinders at 4000 pounds per square inch pressure and carried on automobiles and trucks. Producer gas from wood also is used as motor fuel in Europe.

The world's production in 1939 of petroleum substitutes from coal amount-



ed to about 28,730,000 barrels, with Germany accounting for nearly 60 percent of the total.

Shale oil is obtained commercially by grinding shales and retorting them in a manner similar to low-temperature carbonization of coal. Australian shales yield about 100 gallons of shale oil per ton, the Estonian 50 gallons, the Scottish and French 25, and the Manchurian shales about 14 gallons. The world's production in 1939 of petroleum substitutes from oil shales aggregated about 2,490,000 barrels, Estonia having been the leading producer, with output of 1,300,000 barrels.

Synthetic alcohol, particularly as methanol, has come into extensive use in Europe for blending with motor fuel. Ethyl alcohol is made largely from potatoes, sugar beets, molasses, rye, and other vegetable substances. The world's production in 1939 of alcohol used as motor fuel was about 7,320,000 barrels, and the United Kingdom, with output of nearly 2,400,000 barrels, was the leading producer.

World Consumption of Petroleum and Its Substitutes in 1940

By V. R. Garfias, R. V. Whetsel
and
J. W. Ristori,
Cities Service Company, New York

World consumption of petroleum and its substitutes in 1940, which with the exception of the United States, *does not include consumption for military purposes even in peacetime,* is estimated at 2,006,000,000 barrels or approximately 21,000,000 barrels less than in 1939. As consumption figures for belligerent countries and those affected by the war are unavailable, in order to arrive at a gross approximation the assumption

V. R. Garfias

J. W. Ristori

has been made that the rate of civil consumption in these countries has declined 80 percent since the German occupation or the effect of the war made itself felt.

In 1940 the total consumption in the United States increased 94,000,000 barrels over the previous year while the civil consumption in the countries directly affected by the war—some of them occupied during the last half of the year—decreased 126,000,000 barrels. In the rest of the world consumption increased 11,000,000 barrels, resulting in an overall decrease in world civil consumption grossly estimated at 21,000,000 barrels.

Although no reliable information is available regarding military consumption in foreign countries before or during the war, military consumption and/or addition to stocks in foreign countries in 1940, as shown in Table 1, are roughly estimated at 221,000,000 barrels or about 35,000,000 barrels more than in 1939. The peacetime consumption for military purposes of these countries has been previously roughly estimated at 47,500,000 barrels.

Some Factors in the Economics of Recycling

By Emby Kaye
Distillate Engineering and Processes Company, Tulsa, Oklahoma

Recycling is the generic term describing the recently developed process by which a condensate is separated from a gas-distillate gas at high pressure and the residual gas is returned to the subterranean reservoir. Before the development of recycling, a great many gas-distillate fields in Louisiana and Texas provided no income to their owners. When gas was taken from the reservoirs there were irretrievable losses of condensate from the formation. The introduction of the recycling process permits the conditioning of gas-distillate fields for the sale of dry gas without waste.

Emby Kaye

The study of a field for possible exploitation involves the evaluation of a number of economic factors, among them being (1) an estimate of the distillate reserves in place, (2) an estimate of the distillate that can be brought to the surface, (3) available market, (4) costs. Estimating the reserves in place has to be done on the basis of acreage, sand thickness, reservoir pressure, reservoir temperature, porosity and connate water. There are difficulties and uncertainties involved in determining what portion of the wet gas reserves may be brought to the surface for processing before dilution or mix-

World Production of Petroleum Substitutes in 1939

COUNTRY	MOTOR FUEL, Barrels										Shale Oil and Miscellaneous Products, Barrels	Total U. S. Barrels
	GASOLINE											
	Natural	From Coal	From Shale Oil	Benzol	Alcohol	Liquid Gas	Methane*	Manufactured Gas*	Producer Gas*	Total Motor Fuel		
United States	49,896,000			2,440,000		†5,000,000				57,336,000		57,336,000
Germany		11,500,000		4,300,000	1,300,000	1,400,000		120,000	40,000	18,660,000	1,500,000	20,160,000
United Kingdom		3,200,000	230,000	2,000,000	250,000			25,000	25,000	5,730,000	600,000	6,330,000
Japan		1,600,000			2,396,000					3,996,000		3,996,000
France		900,000	13,000	600,000	1,600,000			230,000	80,000	3,423,000	75,000	3,498,000
Canada	3,000,000									3,000,000		3,000,000
Netherlands E. Indies	2,000,000									2,000,000		2,000,000
Estonia			220,000							220,000	1,080,000	1,300,000
Russia	1,000,000		40,000							1,040,000	175,000	1,215,000
Peru	1,100,000									1,100,000		1,100,000
Mexico	1,000,000									1,000,000		1,000,000
Iran	1,000,000									1,000,000		1,000,000
Venezuela	1,000,000									1,000,000		1,000,000
Rumania	800,000									800,000		800,000
Colombia	700,000									700,000		700,000
Italy	60,000				350,000		71,000	110,000	40,000	631,000		631,000
Australia			1,200		450,000					451,200	5,000	456,200
Argentina	450,000									450,000		450,000
Belgium				300,000						300,000		300,000
Philippine Islands					300,000					300,000		300,000
Sweden				5,000	250,000				20,000	275,000		275,000
Trinidad	250,000									250,000		250,000
New Zealand					180,000					180,000		180,000
British Borneo	160,000									160,000		160,000
Egypt	160,000									160,000		160,000
British India	150,000									150,000		150,000
Poland					100,000					100,000		100,000
Ecuador	80,000									80,000		80,000
Hungary					80,000					80,000		80,000
Spain			9,500							9,500	41,000	50,500
Lithuania					50,000					50,000		50,000
Chile					13,000					13,000		13,000
	62,806,000	17,200,000	513,700	9,645,000	7,319,000	6,400,000	71,000	485,000	205,000	104,644,700	3,476,000	108,120,700

* Used as gases for transportation motor fuels. † Largely propane-butane.

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the COMPOSITE CATALOG

OF OIL FIELD AND PIPE LINE EQUIPMENT

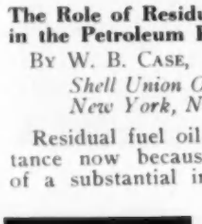
ing with dry gas makes the operation uneconomical. A description is given of a sampling device for taking a representative sample of gas from condensate wells flowing under actual conditions.

The principal methods for recovery of distillate from wet gas are: (1) mechanical refrigeration and retrograde condensation, (2) regenerative cooling and retrograde condensation, (3) absorption processes operating at high pressure. In some plants combinations of the above methods are used. The character of the gas, or the nature of the desired product, or both, may often control the choice of method.

The Role of Residual Fuel Oil in the Petroleum Industry

By W. B. Case,
Shell Union Oil Corporation, New York, New York

Residual fuel oil is of special importance now because of the possibility of a substantial increase in consumption by the navy and by industries engaged in manufacture of defense materials where this product has decided advantage over other forms of fuel.



W. B. Case

In this connection, it is to be expected that the yield of residual fuel oil from crude oil will continue to decline; that in spite of possible increases in crude runs to still to meet growing demand for the major petroleum products, no great increase can be expected in the amount of residual fuel oil available.

Gains in demand for residual oil might be met in one or several of the following ways: by processing more crude, by increasing the yield of the product, by varying relative production of high- and low-gravity crudes, by moving surplus California stocks to the East Coast, by importing additional supplies, or by restricting use to channels where other fuels cannot be substituted.

(In California there is no problem whatever in meeting any conceivable increase in demand.)

Of these six methods for balancing supply and demand, the first two appear contrary to the progressive principles which the industry has followed over the years. Runs to stills have been regulated to meet the demand for gasoline and distillate fuel oil, essential products for which there are no acceptable substitutes. And if the industry attempted to bring into the determination of required runs to stills the supplying of a by-product (residual fuel oil) to be used in destructive price competition with other fuels, the supply of the essential products would greatly exceed the demand, valuable reserves of petroleum would be needlessly depleted, and chaotic conditions would result.

The proposal of varying production of high-gravity and low-gravity crudes seasonally, in accordance with current demand, has many merits. But the proposal has been opposed on the grounds that inequities would result in the administration of proration; that low-gravity crudes produced in the summer may be stored for use in winter and high-gravity crudes produced in winter similarly may be stored for use in summer. And in any event, if greater year-round demand for low-gravity crudes actually existed, it would be reflected in proration schedules.

Possibility of moving residual fuel oil from California depends entirely on tanker rates, availability of boats, and the price to be realized in the eastern market. Such movement currently is unprofitable, costing 2½ times as much as to bring supplies to the East Coast from the Gulf Coast or refineries in the Caribbean. The latter movement releases for domestic use an equivalent amount of the fuel, and may be expected to continue at a high level.

The proposal of restricting use need not be invoked. For the flexibility of the market and free functioning of price will assure an adequate supply at reasonable price to the "inflexible" consumers, who cannot conveniently or economically substitute other fuels, among them being most of the railroads now using the fuel, to some extent the oil companies themselves, and a part of those who use the product for heating. (Use in ships in inflexible, but those engaged in international trade can buy elsewhere than in the United States if prices in other ports are more attractive.) The inflexible use is about 50 percent of the total use. Flexible users are the gas and electric power plants and most industries, which normally vary their consumption as the price of residual fuel oil goes up or down.

Mineral Rights Assessments, with Special Reference to Kern County Procedure

By Paul J. Howard
Chief Appraisal Engineer, Kern County Assessor's Office, Bakersfield, California

The problem of assessors who have to make numerous mineral property assessments each year is not that of making detailed engineering appraisals, but that of developing methods for mass appraisals which can be applied annually to numerous properties and still keep assessments within reasonable limits as determined by conventional methods.

The problem in making mineral-land assessments consistent with conventional appraisals is not as difficult as it appears at first. The factors affecting value must be kept in mind and at least the most important ones given consideration.

Several California counties have done this in more or less detail with improved results. The greater the number of factors that can be considered, the more accurate will be the assessments. But too great accuracy should not be attempted when it will result in great additional expense and more work than can be handled properly during the assessment season.

The oil-field assessment methods give consideration to the following factors: ability of wells to produce; price received for the well products, including crude oil, gas, and gasoline; field operating costs; general overhead expense; decline rates on the various properties for the past year; average normal decline rates for wells of similar size in the same field or zone; and deferred income due to curtailment.

Gas fields and mining properties are assessed, as far as practicable, by conventional engineering appraisal methods.

Dangers of Underestimating Germany's Self-Sufficiency in Liquid Fuel

By B. Orchard Lisle,
Consulting Petroleum Technologist, New York, New York

Although it is beginning to be recognized that Germany is not so badly lacking in liquid fuel supplies as had formerly been thought, there is still a tendency to underestimate that country's resources. Efforts have been made, in spite of censorship and propaganda, to obtain reliable estimates on the quantity and quality of the potential Nazi productive capacity.

Germany is producing substitutes for petroleum oils by various synthetic processes, the leading ones being: hydrogenation of coals, lignite and tar oils; the Fischer-Tropsch synthesis of liquid products from gases; the Fischer-Pichler Mittelbruck, medium-pressure synthetic process; the Pott-Broche process of obtaining liquids from coal by a combination of solvent extraction and hydrogenation; the Uhde process, somewhat similar to the Pott-Broche method; and numerous variations of the coal carbonization process. Also, Germany is making up for deficiencies in petroleum supplies by the use of liquefied gases as motor fuel, the use of alcohol, "gasogene" generation of fuel gas by burning wood, coke, etc.

Germany has had her annual production of domestic petroleum increased materially by discovery of a new field shortly before the outbreak of the war. Furthermore, the German-occupied countries of Poland, Austria, Czechoslovakia and France are yielding increasing quantities of oil under German control and exploitation. Germany may be securing at least half of Hungary's annual production of about 1,700,000 barrels, and is likely to obtain all the 21,000,000 barrels or more of exportable petroleum from Rumania. From Russia and Sovietized Poland, Germany has been getting unknown quantities of oil.

Altogether, it is concluded that during 1941 Germany may be provided with a total of about 46,188,000 barrels of "ersatz" materials, some 8,800,000 barrels of crude from oil fields in Greater Germany and officially occupied countries and an additional 32,350,000 barrels from countries within the Axis or under its domination. The grand total is 87,338,000 barrels. This compares with an estimated grand total of 56,648,000 barrels in 1940.

With respect to the quality of gasoline made by the hydrogenation process, it is possible to secure a fuel with a C.F.R. octane number of 70 or higher. Richer materials permit manufacture of gasoline of 85-octane number, and with the use of tetraethyl lead the gasoline may have its octane number raised to 92 or 95. British tests of fuels taken from captured German planes showed that the planes had been operating on gasoline of 92-octane number.

War Conditions Leave Little Information For World-Wide Symposium

SHADOWS of the war in Europe hung heavily over the session of the American Institute of Mining and Metallurgical Engineers in New York February 19 in the discussion of the oil situation abroad. While Europe and the Near East, as well as the Far East, were touched on by speakers, but little information was made available and some of that was given "off the record."

Judging from the reports, the Near East is also feeling a depressive effect in a slackening demand for production. Speakers differed on how plentiful Germany's supply of oil now is, although there was no great disagreement as to the amount of crude oil available if Germany chooses to shut off domestic consumption in countries under German domination. Rumania's domestic consumption was given as 14,500,000 barrels annually, out of production which was given as 100,000 barrels per day—with 40,000,000 per year as "possible."

Russia's domestic demands were estimated as being in excess of production, but with some Russian oil going to Germany—a comparatively slight amount, however.

The new fields which were named as being added in Europe and Asia during 1940 were named almost under breath—again off the record.

This was also true of South America, but possibly because certain South American papers had not arrived at the time of the meeting, which was held in the morning. Glen Ruby, one of the American geologists employed by the Argentine government—one of a group which seems to have done a pretty good job, incidentally, expressed the belief that Argentina within three years will be self supporting from an oil-production standpoint. Four or five new fields in Mendoza province, he said, have splendid possibilities.

The discussion on Russia indicated that the oil business is far from well organized in there. This is in accord with reports which have been coming out of Russia for some time.

Russia and Rumania, the two largest producing countries in Europe, came in for most of the discussion. Rumania had 50 drilling wells on December 24. A new pipe line is being built with the "Iron Gates" on the Danube as its terminus to speed up movement of Rumanian oil to Germany . . . . Albania's 5000 barrels per day is doing Italy little good because its shipping port, Valona, is under constant attack from R.A.F. and Greek planes . . . Consolidada's (Sinclair) well in Eastern Venezuela is the best looking bet there this year.

Petroleum Developments in Canada in 1940

By G. S. Hume

Department of Mines and Resources, Ottawa

Canada's crude oil and natural gasoline production in 1940 totaled 8,718,053 barrels, valued at $11,113,000, compared with 7,838,310 barrels of $10,353,351 value in 1939.

Turner Valley in Alberta accounted again for the bulk of the total, having produced 8,452,527 barrels, against 7,556,029 barrels in 1939.

The whole province of Alberta in 1940 produced 8,493,237 barrels, compared with 7,595,000 in 1939; while output in other provinces included 186,471 barrels in Ontario, against 206,196 the year before; 21,161 in New Brunswick, against 20,101; and 17,184 barrels in the Northwest Territories compared with 17,013.

Turner Valley development included completion of 36 wells, all productive.

An outstanding development of the year was completion of a well in the Steveville area, on the Plains, 100 miles east of Calgary. The well was completed late in December with an initial flow of 520 barrels of 26.3 gravity oil from the upper part of the Mississippian limestone. It opened a new field and gave further proof of the potentialities of the Southern Plains. On flat prairie land, the new field was found by geophysical methods.

Turner Valley field, discovered in 1924, has 5,000 acres proved for oil and 10,000 for gas. The field had produced 35,931,370 barrels of oil to the end of 1940. And at that time 131 wells were producing oil, including 130 that were flowing and one on artificial lift.

Efforts to discover new oil fields in the foothills of Alberta, other than Turner Valley, have been so far unsuccessful. A well 120 miles west of Red Deer, Alberta, was abandoned at 8728 feet.

Abandonment of a test at 7011 feet on the Grease Creek structure, 45 miles northwest of Calgary, left that area inadequately tested.

The year's abandonments included a test in Waite Valley west of Turner Valley field, drilled below 7,600 feet; the Sheppard Creek well, south of the Pekisko area, 5995 feet deep; the Alliance well in the southern foothills near Beaver Mines, west of Pincher Creek, which was drilled to 6723 feet; the Roxana well in the Moose Mountain area, 40 miles west of Calgary, 1¾ miles south of the west end of the Stony Indian Reserve, 6502 feet deep.

In Gaspe Peninsula, Quebec, Imperial Oil Company test was abandoned at 5995 feet.

Developments in Russia in 1940

By B. B. Zavoico

Department of Petroleum Economics, Chase National Bank, New York

Production in Russia in 1940 was 220,000,000 barrels, which was but slightly higher than production the previous year. Although the Russian output planned for 1942 is much higher than 220,000,000 barrels, there is uncertainty as to whether the scheduled production will be realized. Difficulties with equipment in use, trouble in obtaining new equipment from abroad and disagreements between management and field personnel have handicapped output.

Practically no storage capacity exists in the Russian oil fields. This has complicated the problem of maintaining a steady and adequate flow of oil to the refineries. Another complication lies in the fact that in the whole country are only 2700 miles of pipe line.

Russia is not exporting appreciable amounts of petroleum products to Germany. The domestic demand for gasoline is considerably greater than the gasoline production. The principal product sent into Germany is lubricating oil, which Germany badly needs because German synthetic methods do not produce satisfactory liquid lubricants.

There is appreciable use of substitute motor fuels in Russia, among these being compressed gases generated by the combustion of such materials as wood, coke, etc. Difficulties are being experienced in using in the cities gas produced in the oil fields.

Petroleum Development in Peru During 1940

By O. B. Hopkins

Chief Geologist, Imperial Oil, Ltd., Toronto, Ontario, Canada

Peru's oil production of 12,127,000 barrels in 1940 was about 10 percent less than that in 1939, as the export market was restricted by the war and unusually competitive conditions.

Nearly all production came as before from the three established fields in coastal, northwestern Peru.

Zorritos field, which was purchased by the government in 1939, was further explored, and the 45 old and 15 new wells together averaged an output of about 200 barrels daily.

Lobitos field's production of 2,435,504 barrels in 1940 was about 10 percent less than the previous year's output.

The La Brea-Parinas area, owned by International Petroleum Company, con-

tinued to account for nearly 80 percent of Peru's production; and 139 wells were completed, compared with 73 the previous year. The completions included 125 producers. Over 85 percent of the footage involved was drilled with rotary equipment. The wells completed included 8 exploratory tests, the most successful of which was one that opened the Rio Bravo pool in the northwest part of the property, in flowing 1072 barrels a day from 2375 feet. At the end of 1940 a test was drilling at 9200 feet in the Upper Cretaceous, in an effort to find Cretaceous production in addition to the established Tertiary pay. Out of 3250 wells so far completed, 2107 still were producing at the end of 1940.

Development in eastern Peru is confined to the Ganso Azul Company's Agua Caliente anticline, near the River Pochitea, where 5 wells have been completed, yielding 46-gravity oil from sands at 1000 to 1260 feet.

The Search for Oil in Australia and Australian Territories

By Arthur Wade

D.Sc., A.R.C.S., F.G.S., F. Inst. Pet., M.I.M.M., M.A.I.M.D., Etc.

Preparation of the Wade model bill for the Commonwealth government in 1939 and its acceptance in principle by all states, has gone far toward removing legal obstacles formerly imposed on petroleum prospecting by the laws which prevented large-scale effort and barred major oil companies from operating.

Following passage of the amending acts, Shell and Superior Oil Company of California took up large areas in Queensland and started work in 1940. Caltex acquired extensive acreage in the Kimberley district of Western Australia and applied for an area in the Territory of Papua. Phoenix Oil Extraction Company (Australian) obtained a permit to prospect a large area along the south coast of Western Australia.

These companies do not contemplate immediate drilling, as much exploratory work will be required.

In Queensland, Shell is making geological, geophysical and aerial surveys. In Western Australia Caltex has 3 geological parties in the field; and in the interior of Queensland, Superior Oil Company has done some geological work.

Drilling in 1940 in the Lakes Entrance Tertiary Basin of Victoria was without much success. To the west near the border of Victoria and South Australia, two tests of Tertiary and Mesozoic formations are being drilled, one having reached 2300 feet without becoming interesting.

Gas showings were found between 3200 and 3220 feet in carbonaceous sandstones in a test in the Kimberley district, Western Australia. A fourth test has been started near Roma in central Queensland, where a good oil showing was found above granite basement at 3510 feet. A location has been made for a deep test at Kariava on the Vailala River in Papua, and another test is being drilled south of that at Oiapu near Cape Possession where oil and gas showings were found in a well drilled in Upper Tertiary to 2769 feet and abandoned in late 1940.

Petroleum Engineering Session Papers Cover Wide Range of Subjects

TEN papers on petroleum engineering occupied the attention of the petroleum division in its first day of sessions (February 18), when the American Institute of Mining and Metallurgical Engineers met in New York February 17-20 for its annual meeting.

The papers covered a wide range of subjects, from new prospecting theories and methods to latest developments in cementing wells and handling drilling muds.

Two papers dealt with the use of the evidences of gases in the earth above oil accumulations as aids in discovering such accumulations. In one of the papers, it was stated that the finding of oil fields has been facilitated by geochemical well logging, which involves analysis of well cuttings in drilling, presence of hydrocarbons in the cuttings giving indication of possible petroleum accumulation. The system was described as having been designed to substantiate the geochemical prospecting method known as soil analysis.

In the other paper on prospecting, the author offered new theory, field technique, and interpretation procedure for measuring directly the rates of leakage of hydrocarbon gases into the atmosphere.

Whereas oil well cementing formerly was done largely by rule-of-thumb methods and calculations, the operation is being put on a scientific basis through advancements described in one of the papers.

Acadia Parish, Louisiana—a Piercement-Type Salt Dome

By Michel T. Halbouty

Consulting Geologist and Petroleum Engineer, Houston, Texas

The manuscript for this paper had not been completed, and the author spoke from notes and presented colored slides, through which were shown cross-sections of the field, contour maps, and other pertinent data.

He comprehensively discussed the geology and production history of the field, and commented on the relationship between the past, shallow production and the present, deep, flank production.

Geological conditions affecting production were discussed, and the various sands of the field were described, as

M. T. Halbouty

were fault blocks encountered, and the type of oil found.

Production figures were given for the several flanks and also for the shallow zones, and per-acre yields for the flanks and the shallow production were indicated.

The field has been exceptionally high in yield per acre.

Finding of new sands around the flanks of the dome has been an important development, and similar possibilities in other fields have been indicated.

New Developments in Oil Well Cementing

By C. P. Parsons

Vice President, Halliburton Oil Well Cementing Company, Duncan, Oklahoma

Formerly, oil-well cementing was carried on largely by rule-of-thumb calculations and methods. Volumetric capacities of holes were subject to errors of considerable magnitude, as were calculations of amounts of cement required. Some developments herein described are aiding in the elimination of such mistakes and are putting well cementing on a scientific basis. The following is a list of operations in which these developments are being used with advantage.

C. P. Parsons

Plugging back highly permeable, low-pressure limestone formations:

The practice known as "water control" is a cementing practice used for controlling water in such formations. It has been used experimentally on over 40 wells having very high water ratios, with successful results in more than half of them. Many of the others had been hopelessly drowned beforehand. The first step in the procedure is determination of permeability of the formation. If needed, acid is balanced into the formation to obtain the proper permeability for the cement to enter. After this comes the careful balancing of cement with a constant check on the fluid level. After the cement hardens, it is cut to the desired level by means of a retrievable acid jet gun. A production test is made by an insert barrel. If

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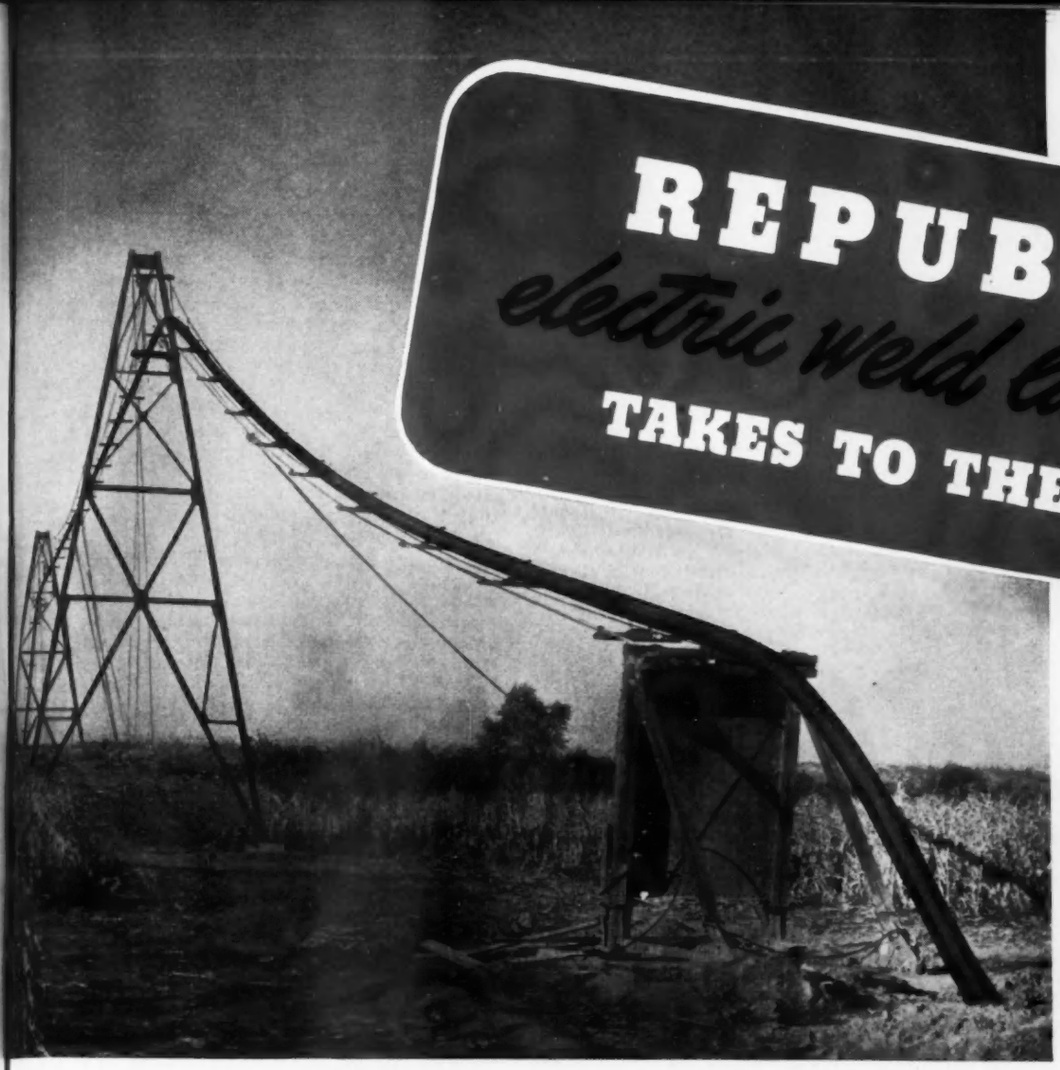

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needed, the jetting and testing are repeated.

Displacement Jobs:

It is possible to measure the actual size, and so to calculate the actual volumetric capacity, of a portion of a well that is to be plugged back with cement by a displacement method. It is possible accurately to measure the change in volume of drilling mud used as a displacing fluid when the mud is subjected to increased hydrostatic head in its travel down the well.

Squeeze Jobs:

Measuring the volumetric change of aerated mud measured at atmospheric pressure, and which may be used as a displacement fluid during a squeeze, provides a basis for more accurate calculation. Use of a dehydrator permits determination of the amount of water which can be squeezed out of cement slurry, as well as physical changes in the slurry when imposed against a sand.

Casing Jobs:

Measurements of variations in the diameter of a hole into which casing is to be lowered and cemented make possible accurate calculations of the amount of cement needed for filling a given length of annular space behind the casing. Bulk cementing, meter-control of slurry and synchronized pumps and mixers eliminate discrepancies in calculations brought about by waste, breakage and partial spoilage of cement in sacks.

Packer Settings:

Calipers eliminate guesswork in selecting packer sizes by reason of the fact that they measure the actual diameter of that part of the hole into which the packer is to be set.

Proportioning Admixtures:

Considerable work has been done in the design and operation of proportioners for adding various materials to the cement slurry, such as bentonite, fibrous materials, lime, etc.

Retrievable Squeeze Cementers:

This new development has been very successful in the field. It is a squeeze packer which can be retrieved from a well immediately after a squeeze, instead of leaving a packer in the well to be drilled out. It is designed to squeeze cement slurry into a formation in the open hole below the casing or through perforations or through leaks in the casing.

Bulk Cementing:

This is a new development designed to improve cementing by assuring fresh, uncaked cement, by eliminating waste of cement when handled in sacks and by proportioning admixtures with the cement. The practice was introduced in Illinois a year ago. It involves uniform feeding of fresh cement into the mixer at the well by bulk transport units.

Chemical Scavenging:

Among new developments is a chemical scavenger to be pumped into a well ahead of the cement for the purpose of removing the soft portion of the filter cake. A mechanical accessory has been designed which allows the chemical scavenger to reach its intended place in proper condition. The purpose of the work is to prevent self-channeling, a condition which may exist in some wells wherein a mixture of cement slurry and parts of the filter cake may form a thick mass. This mass may roll up behind the casing and build into a slug through which uncontaminated slurry breaks a channel.

Geochemical Well Logging

By Leo Horvitz

Subterrex, Houston, Texas

Geochemical well logging involves the analysis of cuttings for hydrocarbons and various inorganic constituents. It was undertaken to obtain information regarding upward migration of hydrocarbons from petroleum deposits, in order to substantiate the geochemical prospecting method known as soil analysis.

Leo Horvitz

It was found that the chemical composition of sediments above an accumulation is modified as a result of this leakage.

Samples of well cuttings are collected for each 30 feet of drilling. After samples are washed free of drilling fluid, they are put in jars and taken to the laboratory.

After determining moisture content, using a small portion of the sample to be analyzed, a part of the fresh sample is placed in a flask and attached to the extraction unit.

The technique for carrying out the analysis of the extracted gases involves the combination of low-temperature fractionation (at low pressures) and combustion methods. The gas sample is separated into three separate fractions: (1) that part of the mixture non-condensable at the temperature of liquid nitrogen (—196° C.) and consists mainly of air, methane, and hydrogen; (2) the part not retained at the temperature of —145° C. but condensable at the temperature of liquid nitrogen, being ethane, propane, and butane, and (3) the volatile sedimentary constituents that are retained at —145° C., made up of pentane and heavier hydrocarbons.

Data obtained from analyses of cutting samples, collected from numerous wells, has shown definite relationships between the constituents determined and petroleum accumulations.

Samples from non-productive wells generally yield negligible quantities of hydrogen.

Greatest reliance is placed in hydrocarbons, and logs of producing wells show low values in the upper part of the well, but at some distance above the accumulation, a definite increase is obtained. Then values gradually increase, until the deposit is reached, when maximum values are obtained. On the other hand, logs of non-productive wells show only small values throughout.

The distance above the deposit over which significantly high values are obtained is dependent on the nature of the accumulation. Also, the relative quantities of the different hydrocarbons in samples bear definite relationship to the composition of the accumulation.

(A lantern slide was shown of a geochemical log of a dry hole 3000 feet from the Lovell Lake oil field. The log indicated that the geochemical effects of a petroleum accumulation extend laterally for only short distances.)

(Various slides showed indication that sediments over a petroleum accumulation are modified as a result of hydrocarbons leaking from the deposit and that the changes produced may be detected in several ways.)

Results of the geochemical surveys suggest that the hydrocarbons present in the sediments above an accumulation originate from the accumulation itself. One log showed significantly high pentane and heavier hydrocarbon values at least 1500 feet above the accumulation; another 750 feet in advance; and a third showed no significant values above the deposit.

The distance above a deposit at which definite hydrocarbon indications are obtained appears to bear a definite relationship to the specific gravity of the deposit.

The practical value of geochemical well logging was illustrated when used in an 8000-foot abandoned well. The survey gave favorable indications and induced the operators to deepen the well. At 8074 feet a gas and distillate sand was penetrated which led to the discovery of a new field.

Since the ethane-propane-butane and pentane and heavier hydrocarbon fractions yielded values of the same order of magnitude, and since significant values were obtained over a relatively long distance, a high gravity deposit was indicated before the accumulation was actually reached.

A considerable amount of research must be done before the geochemistry of a petroleum deposit will be entirely clear. Data of the type here discussed indicate, however, the necessity for revision of the former concept of a petroleum accumulation as an inert and static mass to one which considers it as dynamic in nature.

The Geodynamic Process

By Sylvain J. Pirson

Petroleum and Natural Gas Department, State College, Pennsylvania

Geochemical prospecting, which has been used for some years in locating wildcat wells, approaches its objective of finding oil or gas accumulations by analysis of the soil air or soil itself, which would contain hydrocarbon gases leaking from the accumulations to the earth's surface.

S. J. Pirson

It is assumed generally that the intensity of leakage is proportional to the amount of hydrocarbon gases retained by the soil. However, the absorbability of solid material for gas depends on the

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type of gas, physical and chemical characteristics of the soil, and conditions under which the soil is exposed to the air.

Considering that the primary purpose of geochemical prospecting is to measure the leakage of hydrocarbon gases into the atmosphere, the author set out to measure the leakage directly, and has evolved a new theory, field technique, and interpretation procedure, which are described in this paper.

Soil air analysis methods and soil analysis procedures do not measure the rate of leakage from the concealed source of gas accumulation. Consequently, the author resorted to the "geodynamic process," which measures essentially the rate at which gases escape into the atmosphere, a dynamic phenomenon.

Accordingly, the rate of pressure build-up in a shallow borehole of measured volume is selectively measured for each of the significant gases leaking from the accumulation of oil and gas sought.

Knowing the pressure rise over a period of time for each of the gases in a vessel of known volume, the results of the measurements can be expressed in various manners: by the volume of a given gas at standard conditions which diffuses either within a given time or per unit area in a given time or by the number of molecules of a given gas which diffuses in a given time in the vessel or per unit area. These data may be shown on maps of the area surveyed.

The assumption that gases leak to the surface of the ground is based usually on the buoyancy theory and the creep theory. But this author has evolved another theory, saying that the leakage of gas from oil and gas reservoirs occurs by pressure differentials. The flow of gas in a porous and permeable medium is governed by Darcy's law.

Upon proper measurement of the dynamic leakage at the surface of the ground, use of a given formula permits estimating depth and shape of the source of the gas and segregation between shallow and deep sources and between a gas field and an oil field.

The interpretation of geodynamic surveys may be both qualitative (estimating depth and width) and quantitative (to obtain an idea of the limits of production and of the depth of the producing sand.)

Because of complications in interpreting geodynamic surveys, geology is necessary to eliminate unlikely possibilities, and also necessary is knowledge of the expected reservoir conditions and of the physical-chemistry of the reservoir.

Successful field work was done with this method in the Music Mountain field, south of the Bradford field of Pennsylvania, where pressure of the reservoir had been maintained by repressuring.

Some of the general conclusions, based on theoretical grounds and limited field procedure, follow: (1) The geodynamic method provides the only direct method of finding commercial oil and gas deposits in place under pressure by observation of the dynamic phenomenon of hydrocarbon gas leakage from the reservoir or high-pressure source towards the surface of the earth or low-pressure region. The method is, therefore, direct and positive, as it will not discover dead oil, depleted pools, or drained-out structures, but will indicate only reservoirs under gas pressure giving an active and continuous leakage. (2) The new method does not require analysis of either soil gas or soil samples, and must be regarded as a distinctly new method. (3) No correction for the type of soil in which the geodynamic measurements are made has been found necessary. (4) Distinction between an oil field, a gas field, or a condensate field before drilling becomes a distinct possibility. (5) The geodynamic measurements are independent of the pressure of organic matter in the soil.

Some Problems of Horizontal Steady Flow in Porous Media

By Morrough P. O'Brien
and
John A. Putnam
University of California, Berkeley, California

Data on the physical and thermodynamic properties of hydrocarbons have been made available in recent years, but the formal method of applying these data to flow in porous media appears not to have been fully developed.

By making usual thermodynamic assumptions and employing existing data on permeability to two-phase flow, Darcy's law may be applied to obtain the flow characteristics for representative combinations of flowing medium and geometry.

The numerical examples presented are based on hydrocarbons for which complete physical and thermodynamic data are available for equilibrium conditions.

The problems presented in this paper represent merely the formal application of existing data and usual thermodynamic assumptions to the solution of idealized flow problems.

The flow systems analyzed have been characterized by simple boundaries and uniform permeability, yielding equations and numerical results not directly applicable to field problems, but the basic methods employed are generally valid.

A practical conclusion which appears justified by the analysis is that the flow is approximately, but not exactly, isothermal, and that deviations from isothermal conditions have a relatively small influence on the weight rate of flow.

Physical Theory of Darcy's Law

By M. King Hubbert
Geologist and Geophysicist, New York, New York

Although the law of flow of a liquid through a sand was experimentally discovered and formulated by Henry Darcy in 1856, the formation still remains predominantly empirical. Furthermore, several non-equivalent expressions for the law are in use. Actually the law is derivable from the basic physical relationships: the principle of conservation of matter and the laws of thermodynamics and hydrodynamics.

In any problem involving the flow of a single-phase fluid through a sand, there are superimposed two vector fields: a field of flow and a field of force. The kinematical properties of the field of flow are deducible from the principle of conservation of matter and

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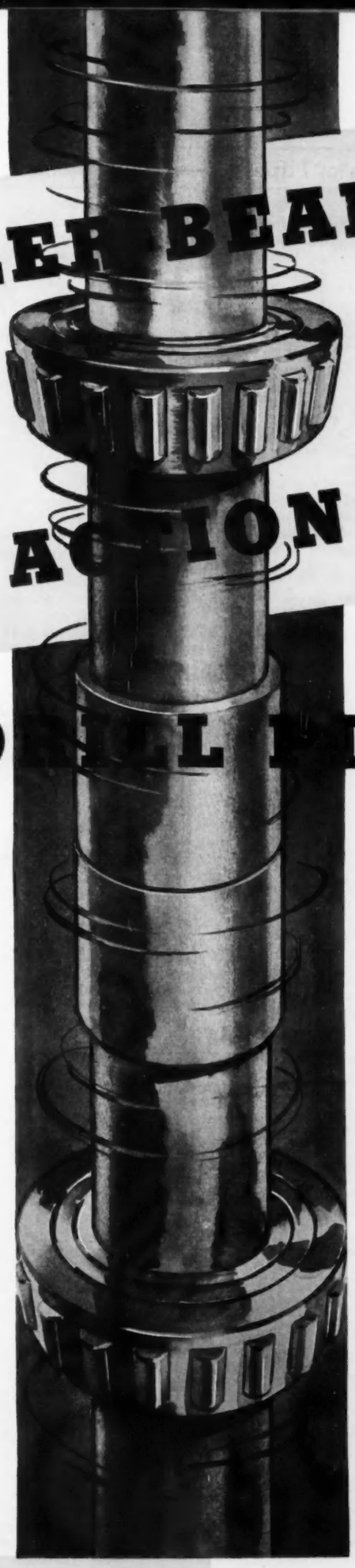

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the equation of state of the fluid. The vector most characteristic of the flow field is the specific mass discharge—the mass of fluid discharging across unit area normal to the flow lines in unit time. The vector characterizing the field of force is the unbalanced or driving force acting on unit mass of fluid at each point in the field.

In earlier studies it had been customary to disregard more or less this driving force and to focus attention on the flow field, assuming that the fluid velocity or specific volume discharge possessed a potential, a velocity potential in this case. The facts are that in general the velocity field does not possess a potential, but the field of force does. This latter result follows from the laws of thermodynamics. In all instances where the fluid density is a function of pressure only, a heat engine not being involved, the line-integral around any closed curve in the field of force must be zero.

$$\phi = \phi_o + \int_{P_o}^{P} E \cos \Theta \, ds,$$

where E is the intensity of the field of force, ϕ_o is the force potential at an initial point P_o, and ϕ is the force potential at a terminal point P. The relationship between the field of force and the field of flow is obtained from the basic equations of viscous fluids. From these it is shown that for isotropic media exists the expression

$$j = -Nd^2 \frac{\rho^2}{\eta} \text{grad } \phi$$

where j is the specific mass discharge of the fluid, N is a shape factor characteristic of the internal shape of the sand, d is a length characteristic of the grain size, ρ and η the density and viscosity respectively of the fluid, and ϕ is the force potential as previously defined. The preceding equation is a general statement of Darcy's law, valid for the flow of both liquids and gases.

At higher velocities, as has been known since Darcy's time, the law is no longer valid. It is shown that the upper limit of the range of validity occurs at the point at which forces due to inertia are no longer negligible as compared with those due to friction, and not, as commonly stated, at the incidence of turbulence.

Factors Influencing Wet Gas Recovery by Recycling

By Judson S. Swearingen,
Associate Professor of Chemical Engineering,
University of Texas, Austin, Texas

In the production of condensate wells by the conventional recycling method the course taken by the dry injected gas is highly important. This fact was not given sufficient attention in the early days of recycling, when the return of gas into the sand was considered largely as a method of gas disposal. Opinions as to the course of the gas ranged from the view that the gas diffused out into the reservoir to the supposition that it channeled directly to the producing well. In 1939 a study was

J. S. Swearingen

made of the patterns formed by the injected dry gas for fields of uniform thickness and uniform porosity and permeability, but available data were meager. A study based on a comparison of actual field data with experimental results has been made.

The datum that is of final interest is the plot of richness against volume circulated in a two-dimensional field. This richness curve is shown to be the differential, or slope, of the total recovery curve. An analysis was made of a one-dimensional path, specifically a narrow tube packed with 30-40 mesh sand. The voids in the tube were filled with dilute sodium chloride solution, and the solution was then displaced with distilled water, which was used instead of gas. From samples taken for chloride determinations the curve of richness at the outlet end of the tube versus volume put through was determined. If displacement were perfect, the salt concentration would drop instantly from a constant value to zero when the pure water reached the outlet end of the tube. Actually, about 95 percent of the salt solution was displaced by the time a volume of water equal to the volume of the voids had been injected. The size of the sand grains is an important factor in the degree to which mixing occurs. Fine sand effects considerably less mixing than does coarse sand for the same distance traversed.

The fraction displaced in a two-dimensional path before the richness falls below a given point because of dilution is of practical concern. A two-dimensional field consists of many single-dimensional paths, some of which go almost directly from the injection to the producing well and others of which follow long, circuitous routes. Due to the differences in lengths of the paths, the streams from the shorter paths become quite lean before the streams from longer paths may have undergone changes. An integration of the richness from all the paths gives the decrease in richness with volume circulated. Inasmuch as some paths are still rich, some are lean and still others are in process of becoming lean, the total drop in richness with volume circulated approaches the result obtainable if displacement were perfect.

It has been suggested by many investigators that a highly permeable stratum through the middle of a producing horizon would permit the dry gas in a recycling operation to pass quickly from the injection well to the producing well and practically dry it up, while at the same time high percentages of rich gas still remain in less permeable layers. The important and hitherto neglected factor in flow through sand is the component of the flow at right angles to the direction of the flow even though the flow through the sand is viscous. This transverse movement is recognized only for turbulent flow through conduits. The extent of the transverse movement of fluid was revealed by experiments with an apparatus introducing dye into one side of a sand-packed tube while water was flowing through the sand. The transverse fraction of movement varied from 1/35 for very slow (viscous) flow to 1/15 for a slightly turbulent rate of flow. Fluid layers having different degrees of richness are brought together between grains of sand, and the distance through which material must go by diffusion as well as the amount transferred are both decreased. Experimental studies show the effects of non-uniform permeability.

A fairly accurate comparison between field data and predicted results can now be made. It is evident that a reasonably accurate estimate of the recoverable reserve of wet gas may be made by the use of experimental data if the data are used in conjunction with a correction factor of 0.8 or 0.9 which varies with relative well positions and the uniformity of permeability of the sand.

The Density of Natural Gases

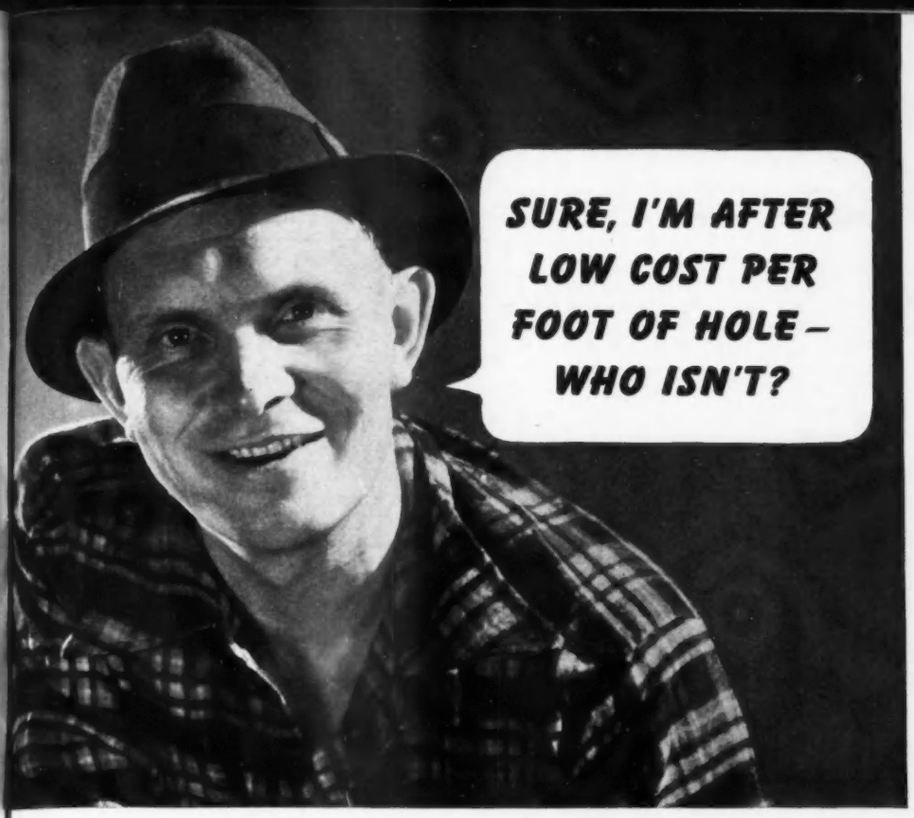
By Marshall B. Standing *and* Donald L. Katz
University of Michigan,
Ann Arbor, Michigan

Data on the densities of natural gases are necessary in many calculations in oil production and utilization. Gas reserves, reservoir pressure changes, gradients in gas wells, gas metering, pipe-line flow and gas compression are typical problems requiring knowledge of the density of the gases involved. Recent discoveries of pools having pressures up to 7500 pounds per square inch, and installation of pressure maintenance and recycling plants have increased the need for gas density data at high pressures.

D. L. Katz

The accepted method of calculating the density or specific volume of natural gases is the use of the ideal gas law corrected by a compressibility factor. The method proposed by Kay, of correlating compressibility factors for gas mixtures on pseudo-critical properties, appears satisfactory for natural gases. The compressibility factor for methane has been shown to deviate systematically from the behavior of natural gases, and a chart giving these corrected factors is available.

This paper presents the data on densities of 16 saturated gases in equilibrium with crude oils. The relationships developed to compute the density of gases to high pressure have been modified and enlarged. A simplified method of obtaining gas density is presented in the form of charts which apply for specific groups of gases. In the process of obtaining equilibrium data on mixtures of natural gas and crude oils, the density and analyses of the saturated vapor phases were obtained. These data were in the



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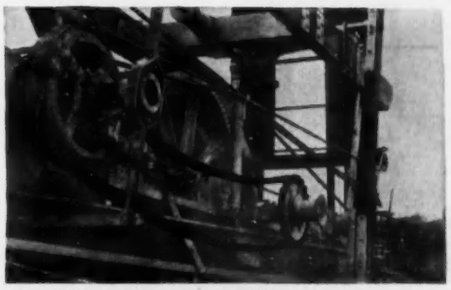

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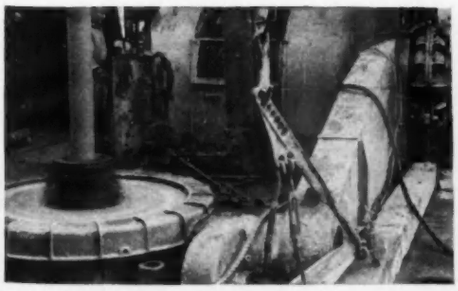

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range of 35 to 250° F. and 1000 to 8220 pounds per square inch.

The recent density data of Sage and Reamer on the separator gas from the Rio Bravo field are compared with the computed densities and compressibility factors. The agreement between computed and experimental results should be representative of gases of that type, since the data were not used in any of the correlations.

A set of charts giving the density as a function of gas gravity, temperature and pressure could be prepared for any series of gases which have a smooth relationship between gas gravity and pseudo-critical conditions. Gases from a common source such as the data of this paper, or gases of similar composition may be expected to have such a relationship.

Control of Filtration Characteristics of Salt Water Muds

By G. R. Gray, J. L. Foster
and
T. S. Chapman,
Humble Oil & Refining Company, Houston, Texas

Inasmuch as oil production might be seriously hampered by infiltration of water from the drilling mud, methods have been developed for evaluating the filtration characteristics of muds.

The wall-building properties of fresh-water muds are commonly regulated by addition of bentonitic clays or agents to promote dispersion of the natural mud solids. But when strata bearing soluble salts are encountered in drilling, the salts are incorporated in the mud; the clay solids are flocculated; and water loss is increased tremendously. Methods generally used in controlling filtration of fresh-water muds are no longer applicable.

In parts of West Texas, salt beds several hundred feet thick must be penetrated before the oil-bearing formation is reached. Since the formation drilled does not provide mud-making material, it is necessary to use large quantities of commercial clays, and even the best commercial clay does not afford relief from the problem of high infiltration.

Consequently, a laboratory study has been made of methods of improving the filtration characteristics of salt-water muds, and some of the methods have been used in field practice.

The laboratory tests indicated, and field use demonstrated conclusively, that the filtration characteristics of salt-water muds can be improved markedly by the addition of natural gums or gelatinized starch. Additional evidence of improvement in wall-building properties was afforded by freedom from stuck drill pipe and ease of running casing to bottom in holes drilled with treated muds.

The extensive use of gums has not been undertaken because both supply and cost have been uncertain since the beginning of war abroad. Starch, on the other hand, is readily available from a number of domestic sources. Pasted starch has been added to the mud used in drilling the productive section in about 80 wells in West Texas.

J. L. Foster

T. S. Chapman

The Mechanism of Fluid Displacement in Sands

By S. E. Buckley
and
M. C. Leverett,
Humble Oil & Refining Company, Houston, Texas

Crude oil has no inherent power to expel itself from the pores of the rocks in which it is found. It must be ejected or displaced by the accumulation of other fluids. Knowledge of the mechanism by which one fluid is displaced by another is needed to understand the process by which oil is recovered. This paper describes in a qualitative manner some features of the displacement of oil by either gas or water.

When pressure on an oil which contains dissolved gas is reduced to the saturation or bubble-point pressure, gas escapes from solution and expands, giving the oil-gas mixture a high degree of expansibility and causing it to flow in the direction of reduced pressure. Hence, it is the accumulation and expansion of the liberated gas which supplies the propelling force for the oil. Within limits a sand containing oil, gas and water will allow the simultaneous flow of all. The production of a reservoir by means of a dissolved-gas drive alone is characterized, for reasons explained, by low initial gas-oil ratio, followed by rapid increase to maximum ratio, with a declining ratio as the supply of gas and the pressure approach exhaustion. Production by a dissolved-gas drive is fundamentally inefficient and the amount of oil which may be recovered is limited.

Under certain conditions, vertical segregation between oil and gas brought about by gravity may be superimposed upon the mechanism of dissolved-gas drive, leading to the formation of "free gas" zones which really are zones of higher gas saturation and lower oil saturation than exist in the lower part of the reservoir. Such segregation leads to the possibility of some degree of mechanical selection in production. If areas of high gas saturation are increased by continued segregation or by the return of produced gas to the reservoir, a displacement of oil in the reservoir may be effected until the area of high oil saturation becomes too small to permit effective control of gas production. In the latter stages of production the gas will again be dissipated, but the deferring of such dissipation and the increased gas accumulation brought about thereby will increase correspondingly the amount of oil produced. The mechanism by which the area of high gas saturation invades that of high oil saturation is very similar to that by which water encroaches into and displaces oil from a sand. The displacing fluid does not act as a piston in driving out the oil; in all cases both the oil and the displacing fluid flow together and simultaneously through the same pores. The actual amount of oil displaced depends on the relative ease with which the oil and the other fluids can move. In turn, this ease of movement increases with the degree of saturation of the material in the sand.

S. E. Buckley

M. C. Leverett

The course of the water saturation-distance curves is influenced by the viscosity of the oil. The more viscous the oil, the less readily it flows under a given pressure gradient. Greater oil viscosity, therefore, results in the attainment of a lower water saturation during the initial phase of displacement as well as a more gradual approach to the residual oil saturation during the subordinate phase of the displacement.

If prior to the advent of the displacing fluid, its saturation in the sand exceeds that which would be obtained during the initial phase of the displacement, then this phase will be absent, and only the subordinate phase will develop. This condition would be found in a water-drive operation where the original or connate water content of the sand is excessive. Where it occurs, it is not possible to produce oil free from water in the part of the sand where this condition prevails. In gas-drive operations such a condition is found if, prior to the injection of gas, the reservoir pressure had dropped to such a degree as to allow the accumulation of gas released from solution in the oil to an amount exceeding the saturation that would be obtained during the initial phase of the displacement. This condition is almost always found in gas-drive operations instituted late in the life of a field or after primary exhaustion.

Capillary forces tend to oppose the formation of saturation discontinuities in a homogeneous sand, while gravitational forces tend to promote complete vertical segregation of oil, gas and water. The two types of forces thus tend to offset each other. The effects of capillary forces are most noticeable in the production by water drive of reservoirs containing intercommunicating sands of variable permeability.

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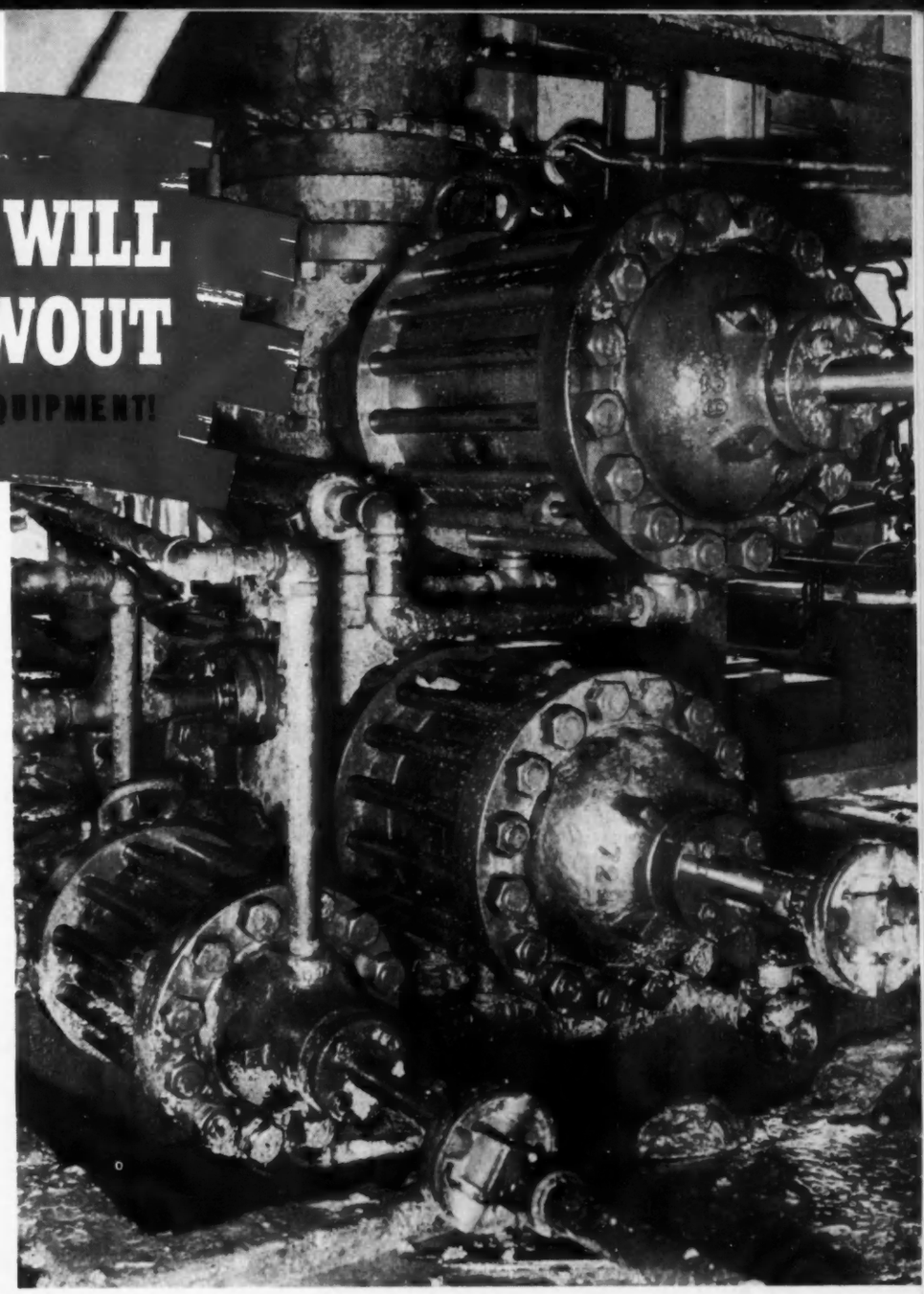

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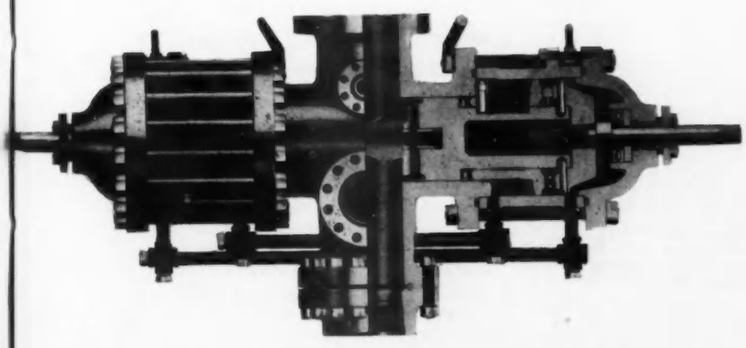
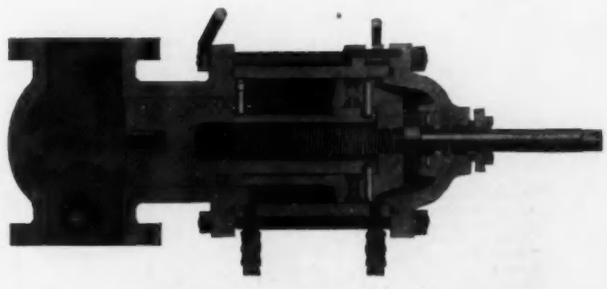


Cross-section view of a Cameron Series 900 A.P.I.—6000 Lb. Test Type SDA Pressure Operated Blowout Preventer.



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Crude Runs Decline to Further Improve Position

A healthy moderation characterized the operations of the week ended February 15, according to statistics issued by the American Petroleum Institute. Crude oil production increased 20,450 barrels daily over that of the week before, a normal increase attributable to new completions. Processing of crude fell further away from the all-time record high of 3,690,000 barrels to which it made dangerously close approach two weeks before. Runs to stills were 3,630,000 barrels, off 10,000 barrels from the previous week, 314 percent under the rate of the same week in 1940.

Reduction of crude oil stocks by 958,000 barrels was not enough to avert reduction of inventories on both gas-oil and distillate fuel, and residual fuel oil classifications. Firmness of the retail motor fuel market is reflected in the fact that gasoline stocks gained only normally despite this strong call for fuel oils and fairly rapid processing of crude. At the latest reported level, that at February 8, crude stocks, at 260,250,000 barrels, were 8.7 percent over those of a year ago.

Stocks of finished and unfinished gasoline rose 1,476,000 barrels in the week ended February 15, making the inventory 94,741,000 barrels, 0.4 percent above that of a year ago, when domestic demand for motor fuels was not near the level expected in the next few months.

Stocks of gas-oils and distillate fuel oils were depleted 951,000 barrels. Inventory of February 15, 35,758,000 barrels, was 39.9 percent over that of a year ago, but here again the proportion is not considered liable to cause any internal strains, as increased demands resulting from industrial defense activity and protracted cold weather are expected to make possession of light and heavy fuel oils profitable, without being heavy enough to cause indiscriminate processing and consequently increased gasoline stock. Stocks of residual fuel oils fell 496,000 barrels, the inventory at February 15 being 99,425,000 barrels, 3.4 percent less than a year ago. This quantity is liable to be proven too low to match the popularity of the product in heavy industrial operations, and should gasoline stocks trend toward an unwieldy level, the scarcity of heavy fuel oils will be the most probable reason. It appears unlikely that the 96,000,000-barrel gasoline backlog suggested by the United States Bureau of Mines in a December, 1940, analysis as being ideal for March 1, 1941, will not be exceeded by a considerable amount. This excess will not necessarily be a distress condition, presuming that inordinate jump in imports and decline in exports during December, 1940, was a temporary condition, as crude inventory at March 1, 1940, was high with business prospects not as encouraging as at the present time.

Trends of Operations and Changes in Stocks

Figures are from American Petroleum Institute weekly reports, except those on crude stocks, which are from Bureau of Mines weekly reports

WEEK ENDED	Crude Oil Production (Barrels Daily)	Crude Runs to Stills (Barrels Daily)	Crude Oil Stocks (Barrels)	Gasoline Stocks (Barrels)	FUEL OIL STOCKS	
					Gas Oil & Dist. Fuels	Residual Fuel Oil
1938:						
November 12	3,243,250	3,180,000	273,394,000	[6]67,551,000	34,175,000	120,491,000
December 10	3,245,100	3,150,000	[6]269,509,000	68,687,000	32,068,000	118,711,000
1939:						
April 22	3,526,700	3,280,000	277,156,000	[2]87,769,000	21,085,000	105,035,000
April 29	3,568,200	3,405,000	278,440,000	86,794,000	[7]25,844,000	[7]108,409,000
May 6	3,580,900	3,275,000	[2]278,607,000	86,216,000	26,167,000	108,597,000
July 29	3,539,100	3,460,000	268,513,000	77,887,000	34,900,000	114,053,000
August 5	[1]3,909,400	3,445,000	268,982,000	76,431,000	35,601,000	114,512,000
August 26	[1]1,690,800	3,475,000	246,982,000	73,475,000	37,722,000	116,237,000
September 30	3,658,200	3,560,000	233,023,000	71,168,000	38,081,000	115,466,000
October 7	3,435,850	3,505,000	231,564,000	[6]71,152,000	38,549,000	114,397,000
October 21	3,771,550	[2]3,650,000	[3]229,127,000	72,122,000	39,358,000	115,060,000
October 28	3,498,500	3,520,000	230,453,000	72,660,000	39,562,000	114,786,000
November 25	3,818,100	3,510,000	231,811,000	75,595,000	38,527,000	112,106,000
December 30	3,545,000	3,445,000	237,742,000	80,985,000	34,184,000	106,680,000
1940:						
January 27	3,611,600	3,470,000	237,339,000	87,914,000	27,407,000	103,015,000
February 24	3,732,100	3,490,000	240,836,000	96,719,000	25,390,000	103,419,000
March 30	3,841,250	3,585,000	250,561,000	101,370,000	23,778,000	105,081,000
April 20	3,858,550	3,535,000	254,881,000	[1]102,817,000	24,779,000	103,323,000
April 27	3,845,250	3,555,000	256,670,000	102,452,000	24,997,000	102,552,000
May 25	3,835,650	3,580,000	259,330,000	100,297,000	28,356,000	104,015,000
June 22	3,846,450	[1]3,690,000	260,891,000	97,276,000	32,751,000	104,683,000
June 29	3,639,550	3,625,000	262,059,000	95,142,000	33,590,000	104,486,000
July 27	3,690,400	3,555,000	262,579,000	90,173,000	38,981,000	105,924,000
August 31	3,501,350	3,575,000	265,865,000	85,393,000	44,766,000	108,774,000
September 28	3,799,950	3,600,000	263,609,000	82,373,000	47,986,000	108,450,000
October 26	3,640,300	3,565,000	262,746,000	80,891,000	[1]48,893,000	108,475,000
November 9	3,584,200	3,510,000	261,631,000	[6]79,847,000	48,408,000	107,687,000
November 30	3,335,050	3,510,000	262,679,000	80,284,000	46,212,000	106,618,000
December 28	3,385,500	3,585,000	261,552,000	83,274,000	42,266,000	102,620,000
1941						
January 4	3,367,200	3,600,000	260,643,000	85,530,000	42,606,000	102,563,000
January 11	3,364,450	3,565,000	259,342,000	86,328,000	41,094,000	102,281,000
January 18	3,611,900	3,490,000	259,934,000	87,351,000	39,920,000	101,213,000
January 25	3,599,100	3,625,000	260,093,000	88,762,000	39,039,000	100,297,000
February 1	3,590,150	3,680,000	261,208,000	90,864,000	37,634,000	100,428,000
February 8	3,617,650	3,640,000	260,250,000	93,265,000	36,709,000	99,921,000
February 15, 1941	3,638,100	3,630,000	.....	94,741,000	35,758,000	99,425,000
February 15, 1940	3,717,950	[8]3,509,000	[4]239,380,000	95,135,000	25,551,000	102,929,000
Change in past year.	—2.1%	+3.4%	+8.7%	—0.4%	+39.9%	—3.4%

[1] All time peak. [2] Peak for year. [3] Lowest since April, 1922. [4] Stocks, February 10, 1940. [5] Lowest since October, 1922, due to shut down of six mid-continent states. [6] Lowest for year. [7] Prior to April 29, 1939, data did not include stocks at terminals, in transit, etc., except in California. [8] February, 1940, daily average.

Motor Fuels Firmest on General Strong Market

No weakness has yet appeared in retail markets for refined products of petroleum, according to census of quotations in the major marketing territories as of February 18. Motor fuels exhibited the same steadiness of the past three weeks, and in some instances, notably in the Chicago and Gulf Coast areas, there was a considerable quickening of demand, with scattered advances in quotations on several grades. In the Tulsa marketing territory, the absence of low price competition was pointed out by several refiners.

Only weaknesses in the market were shown in Oklahoma range oils and Atlantic Coast quotations on kerosene and light fuel oils. In the first instance, the minimum quotation dropped ⅛ cent to 3⅞ cents, while the range on No. 3 light fuel oil was dropped ⅛ cent. In the Eastern seaboard area, scattered quotations on kerosene and light fuel oils were posted that were 0.1 to 0.2 cents lower than the scale on the accompanying table.

Western Pennsylvania refiners were still feeling the pinch for bright stock and neutral oils, the quotations increasing ½ cent on 145-155 viscosity types.

General indication that Mid-Continent refiners are handling all the business they are able was seen in the fact that an inquiry for 35,000 barrels of Kansas-Oklahoma crude per day was circulated for several days without getting any action. The crude was needed for an existing refinery in the Chicago area, and a proposed refinery in the Chicago or Detroit areas, and will probably be supplied from the Gulf Coast.

Only change in military procurement and defense program demands for petroleum products was in announcement that all premium gasoline purchased would be raised from 77- to 80-octane. The change represents an attempt to modernize federal specifications and satisfy the Army demands for an all-purpose gasoline suitable for motorized ground equipment.

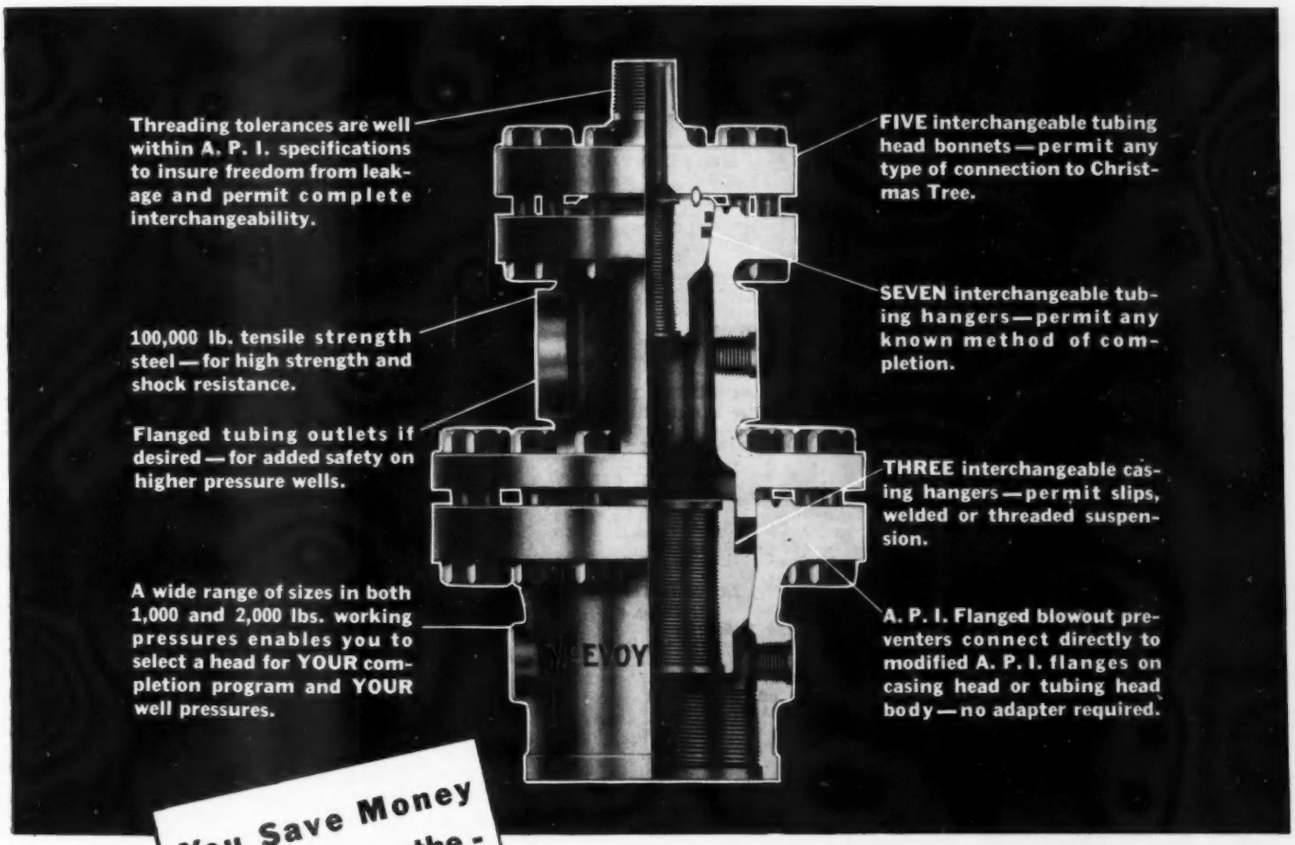
Federal Gasoline Taxes Down in January

Declining for the second successive month, federal gasoline-tax collections in January dropped to $23,306,897 from $25,566,483 in December, and were but $4,000,000 above the January, 1940, revenue of $19,228,329 despite the 50 percent higher tax rate, it was reported February 20 by the Internal Revenue Bureau.

Lubricating oil taxes also declined, to $2,340,219 from $2,663,018, and were $275,000 under the January, 1940, total of $2,615,468, it was stated.

Collections from pipe-line transportation, however, increased from $853,927 in December to $918,290 in January, but were $130,000 under the $1,049,642 of the first 1940 month, the report showed.

For the first seven months of the current fiscal year, six of them under the 1½-cent tax rate, gasoline tax collections aggregated $197,201,087, an increase of $59,545,660 over the $137,655,-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100,000 lb. tensile strength steel—for high strength and shock resistance.
Flanged tubing outlets if desired—for added safety on higher pressure wells.
A wide range of sizes in both 1,000 and 2,000 lbs. working pressures enables you to select a head for YOUR completion program and YOUR well pressures.
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NOW you can have really safe, flexible casing nests for your medium pressure wells at a lower cost than ever before. For example, the nest shown above (10¾" x 7" x 2½" series 600, 2000 lbs. working pressure) costs only $243.52.

You save money on the first cost of McEvoy Type D casing nests—yet you sacrifice none of the necessary requirements of *high quality* heads. Simplified design and standardization permits us to give you top quality materials and fine machining at a lower cost per unit.

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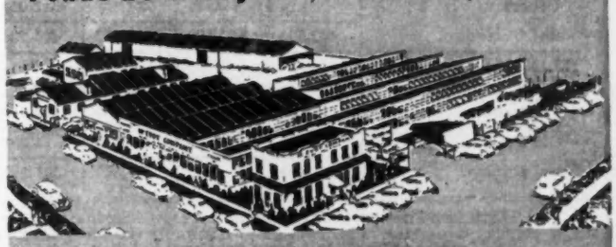


EXPORT OFFICE
30 Church Street, New York, N. Y.

427 received in the corresponding period a year ago, the bureau announced.

Lubricating oil collections for the seven months were $21,630,444, against $18,718,231 a year ago, an increase of $2,912,213, and pipe-line transportation revenues were $6,967,472, against $6,592,239, an increase of $375,233.

Wholesale Prices of Refined Products

REFINED GASOLINE	Range Last week (Cents a gal.)		Changes from week Before	
Oklahoma Refineries:				
60 Octane and under	3¾	4¼	...	...
63-66 Octane	4	4½	...	...
72-74 Octane	4⅝	5	...	...
Mid-Western Tank Car:				
60 Octane and under	3¾	4¼	...	...
63-66 Octane	4	4½	...	...
72-74 Octane	4⅝	5	...	...
New York Harbor:				
68-70 Octane	5½	5½	...	...
72-74 Octane	5½	6⅞	...	...
Gulf Coast:				
60 Octane unleaded	3⅞	4	...	...
65 Octane unleaded	4	4¼	...	...
72-74 Octane leaded	4	5	...	...
NATURAL GASOLINE				
Grade 26-70:				
F.O.B. Group 3	2⅜	2⅜	...	...
F.O.B. Breckenridge, Tex.	2	2	...	...
KEROSENE				
Oklahoma Refineries:				
41-43 water white	4	4¼	...	...
42-44 water white	4¼	4⅝	+⅛	...
Mid-Western Tank Car:				
41-43 water white	4¼	4¼	...	...
42-44 water white	4¼	4⅝	...	...
New York Harbor	4⅞	5⅜	—¼	...
RANGE OIL				
At Oklahoma Refineries	3⅞	4⅛	—⅛	...
In Mid-Western Market, Group 3, basis	3⅞	3⅞	...	—⅛
LIGHT FUEL OILS				
Oklahoma Refineries:				
No. 1 straw	3⅜	3¾	—⅛	—⅛
No. 3	3¼	3⅜	—⅛	—⅛
Mid-Western Tank Car:				
No. 1 white	3⅞	4	...	...
No. 3	3¼	3½	...	...
New York Harbor:				
No. 1	4⅞	5⅜	...	...
No. 3	4⅜	4⅞	...	...

HEAVY FUEL OILS	Range Last week (Per Bbl.)		Changes from week Before	
Oklahoma Refineries:				
No. 6	$0.65	$0.65	...	...
Mid-Western Tank Car:				
No. 5	.75	.85	...	...
No. 6	.55	.60	...	...
New York Harbor:				
No. 5	1.55	1.55	...	...
No. 6	1.25	1.25	...	...
BUNKER C FUEL OIL (Per barrel, ships bunkers)				
Gulf Coast	$ .80	$ .85	...	...
New York Harbor	1.25	1.25	...	...
DIESEL OIL (Per barrel, ships bunkers)				
Gulf Coast	$1.40	$1.70	...	...
New York Harbor	1.75	1.75	...	...
Los Angeles Basin, 27 gravity	1.20	1.26	...	...
LUBRICATING OIL (Cents a gal.)				
Oklahoma Refineries:				
Bright Stock, 150-160 viscosity at 210°, 10-25 pour test	13	15½	...	...
Neutral oil, pale No. 3 color, 150 viscosity at 100°, 0-10 pour test	8	10¼	...	...
Western Pennsylvania:				
Bright Stock, 145-155 viscosity at 210°, 25 pour test	14	14½	...	+½
Neutral Oil No. 3 color, 150 viscosity at 70°, 25 pour test	19	20	...	...

East Texas Refining Drops To All-Time Low Mark

Refinery operations in the East Texas field are currently at the lowest level attained in the 10-year period that the district has been a factor in refined oil markets. Refinery throughput dropped to 11,600 barrels daily average the past week, with five plants processing from 2000 to 2700 barrels of crude, semi-refined oils and distillate daily. Only one plant was qualified for federal tenders. Two refineries are operating on spot purchases of a mixture of high-gravity crude and distillate purchased in the Chapel Hill field, Smith County, from the Chapel Hill Gas System, which makes deliveries from storage tanks near Overton.

Partially Developed Ector County Properties Sold

Two deals involving partially developed properties in Ector County fields were concluded last week. Stanolind Oil & Gas Company paid $275,000 cash for one-half interest and operating control of Mike J. Delaney et al's leases in the North Cowden and Foster fields, involving 1680 acres with 11 completed wells. George P. Livermore, Inc. acquired from The Ohio Oil Company lease on 800 acres with two producers, in the north portion of the Foster field, for $50,000 cash, plus one-eighth overriding royalty.

United States Crude Oil Production Down 20,350 Barrels

Estimates Compiled by The OIL WEEKLY

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (Feb.)	State Allowable (Barrels Daily in Feb.)	BARRELS DAILY FOR WEEK ENDED Feb. 15	Feb. 22
TEXAS—				
Texas Panhandle	.....	.....	67,500	76,000
North Texas	.....	.....	101,150	101,500
West Central Texas	.....	.....	30,200	29,950
West Texas	.....	.....	235,200	237,000
East Central Texas	.....	.....	71,800	71,800
East Texas Field	.....	.....	375,100	374,500
South Texas	.....	.....	205,000	205,200
Texas Gulf Coast	.....	.....	259,900	255,750
Total Texas	1,312,900	1,318,873*	1,345,850	1,351,700
CALIFORNIA—				
Long Beach	.....	.....	41,900	41,500
Midway-Sunset	.....	.....	55,300	45,600
Kettleman Hills	.....	.....	39,400	37,200
Wilmington	.....	.....	85,500	82,400
Others	.....	.....	406,700	406,000
Total California	595,700	571,000†	628,800	612,700
OKLAHOMA—				
Oklahoma City	.....	.....	87,100	88,500
Seminole Area	.....	.....	106,150	105,650
Others	.....	.....	214,400	212,550
Total Oklahoma	442,500	400,000	407,650	406,700
ILLINOIS—				
Salem	.....	.....	108,300	106,800
Louden	.....	.....	70,000	71,000
Centralia	.....	.....	13,700	13,400
Other New Pools	.....	.....	128,500	123,100
Old Pools	.....	.....	11,100	11,200
Total Illinois	342,100	.....	331,600	325,500

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (Feb.)	State Allowable (Barrels Daily in Feb.)	BARRELS DAILY FOR WEEK ENDED Feb. 15	Feb. 22
LOUISIANA—				
North Louisiana	.....	.....	69,100	69,300
South Louisiana	.....	.....	225,750	222,850
Total Louisiana	288,600	294,942	294,850	292,150
KANSAS	193,200	196,200	203,100	207,100
NEW MEXICO	100,700	106,000	101,000	100,750
EASTERN STATES—				
Pennsylvania Grade	50,000	.....	66,950	70,500
Others, Eastern	49,300	.....	27,350	23,200
Total Eastern States	99,300	.....	94,300	93,700
MOUNTAIN STATES—				
Wyoming	74,600	.....	75,200	73,900
Montana	20,000	.....	18,500	18,650
Colorado	3,900	.....	3,650	3,600
Total Mountain States	98,500	.....	97,350	96,150
MICHIGAN	47,500	40,000‡	40,150	40,000
INDIANA	22,500	.....	20,350	20,300
ARKANSAS	66,100	69,969	70,750	70,300
MISSISSIPPI	16,100	.....	19,500	17,200
NEBRASKA	3,200	.....	2,750	3,400
§Total 8 Prorated States	3,047,200	2,996,984	3,092,150	3,081,400
Total United States	3,628,900	.....	3,658,000	3,637,650

*** Estimated net basic daily allowables as of February 1. Railroad Commission estimates that actual production normally is about 3 percent under the allowable. But allowable normally increases as new wells are completed. Under February-March order, most Texas fields were ordered shut down February 1, 2, 8, 9, 15, 16, 22, 23 and 28; March 2, 8, 9, 15, 16, 22, 23, 29, 30 and 31. Texas Panhandle was ordered shut down February 2, 9, 15, 16, 23 and 28; March 2, 9, 15, 16, 23, 30 and 31.**

† Recommendation of Conservation Committe of California Oil Producers.

‡ Estimate of actual production under prescribed regulations, which do not fix a definite state total allowable.

§ Texas, California, Oklahoma, Louisiana, Kansas, New Mexico, Arkansas, Michigan.

U. S. FIELD OPERATIONS

Illinois

Flowing Well Spurs Interest in Salem Field's Trenton Horizon

Magnolia Petroleum Company's Shanafelt 32, Section 29-2n-2e, second Trenton producer in the Lake Centralia-Salem field, Marion County, flowed 342 barrels while being cleaned out 10 feet off bottom, spurring interest in development of the field's new deep horizon. Total depth is 4609 feet. The Trenton discovery was completed as a 225-barrel pumper. Most observers were of the opinion Shanafelt 32 would make from 400 to 500 barrels when completed. It has been shot with 100 quarts of nitro. Several other Trenton operations were near completion. The Texas Company had casing set at three ventures, and Magnolia Petroleum Company was waiting on cement at another test.

A semi-wildcat in northern Hamilton County, Kingwood Oil Company's Moore 1, S½ SE NW 2-4s-6e, pumped 215 barrels in 22 hours, its best gauge, from 3412 feet in McClosky lime following an acid treatment. In later tests, it was settling to about 125 barrels a day. It is ½ mile east of the company's discovery, only producer in the area, completed as a light McClosky producer several months ago.

A wildcat in Wayne County has been successfully completed, The Pure Oil Co.'s McConnel 1, E½ NW NW 32-2n-8e, which made about 325 barrels in 24 hours from McClosky lime at 3062-3066 feet. Location is not far south of the Clay City field in Clay County, where the company completed the first Rosiclare producer, Moseley Consolidated 1, N½ SE SW 3-2n-8e, a 400-barrel flowing well in pay at 2956-60 feet, with total depth of 3063 feet. The test was acidized with 5000 gallons. Although several operators reported oil shows in the Rosiclare while drilling in the area during its early development, there were no completions in the horizon. All operations were carried to the McClosky. Moseley Consolidated 1 was plugged back from McClosky.

The Pure Oil Company also completed the first combination producer in Jasper County, Rohr 1, C E½ SE NE 5-5n-10e, producing from the Aux Vases at 2700-17 feet and McClosky at 2784-86 feet. Total depth was 2820 feet. Two acid treatments were used, one of 1500 and the other of 5000 gallons. The well pumped 450 barrels initially.

A Williamson County wildcat, E. S. Adkins' Old Ben Coal Company 1-D, SE SE SE 4-8s-2e, was drilling below 2060 feet after finding a non-commercial oil show in the Tar Springs.

Franklin Wildcat Pumps 50-50

Four miles south of production in the Benton pool, Franklin County, Adkins' Orient 1-B, SE NE NW 12-7s-2e, pumped 50 barrels of oil and 50 barrels of water in 24 hours from Tar Springs, topped at 2054 feet, but was shut down for pump repairs. The Benton field is also productive in the Tar Springs. Adkins' newest completion in the field was Orient 2, SE SW SE 24-6s-2e, which pumped 425 barrels in 24 hours.

W. S. Tatum's Andrews 1, SE NE SW 7-4n-2w, Bond County wildcat, was shut down on orders at 2537 feet after drilling through the Devonian, where a stain of oil was found. Elevation is 515 feet. Another Bond wildcat, Haines et al's Hunter 1, SE SE SW 1-5n-4w, was abandoned at 1208 feet. A non-commercial oil show was found at 960 feet.

Benedum-Trees' Cavitt 1, Johnson County wildcat near Vienna, SW SW NW 24-11s-3e, was drilling in chirty lime at 3618 feet. The well is scheduled to explore the Devonian and had a show of oil in Benoist sand.

A new test in the Albion field, Edwards County, Mono-Continental's Arch Smith 1, Section 12-2s-10e, probably will explore the Devonian lime. Tools were being rigged up. Production in the field is now limited to three shallower pays, deepest of which is the McClosky.

Sohio Corporation was planning to build a pipe line into Mt. Carmel, Wabash County, to handle production of townsite wells. Wells in the area are producing from three horizons, Biehl sand, Cypress sand and McClosky lime.

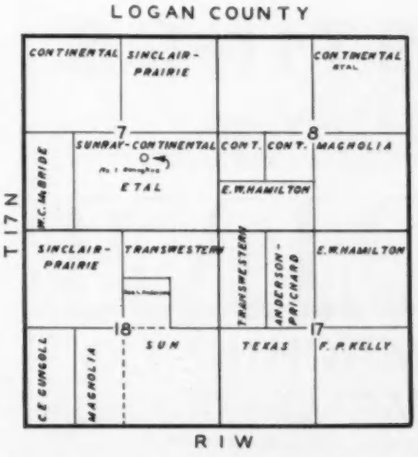
Ruwaldt's Oslager 1, second well in the new Woodlawn field, Jefferson County, NE SE SE 26-2s-1e, was showing for a 100-barrel Benoist well at 2014 feet.

In White County, Skelly Oil Company's Knight 1, offset to Mabee Drilling Company's Tar Spring discovery well, NW 15-7s-9e, was plugged back to 2368 feet for a second test of the Tar Springs. When plug first was drilled, water encroached.

Oklahoma

Logan Wildcat Shows Oil In Second Wilcox Sand

Sunray Oil Company et al's Donaghue 1, C NW SE 7-17n-1w, west of Langston pool, Logan County, was preparing to drill plugs to test second Wilcox sand, topped at 5425 feet. Core at 5431-37 feet recovered six feet of tightly cemented sand with light brown color, fair spotted porosity and odor and small show of gas. No oil showed under microscopic view. Second core at 5437-45 feet gave five feet of brown sugary sand with even staining, gas, good odor, fair porosity and faint saturation in spots. Core analysis revealed average porosity 8.9 percent, saturation 12.5 to 23.5, and gravity 42 degrees. Electric log showed good porosity and saturation in sand at 5049-62 feet. Misener sand at 5132-55 feet had poor porosity, believed non-productive. Second Wilcox showed good resistivity and porosity with no evidence of salt water in core. Seven-inch casing was cemented with 350 sacks at 5423 feet.



Location of Logan County Test

Continental Oil Company bought a quarter interest from Hamilton and S. E. Cullinan, located in W½ SE 7 and E½ SW 7, paying $150,000, part cash and oil payment. W. C. McBride, Incorporated, Tulsa, acquired W½ SW 7. Sunray Oil Company took over operations of the wildcat and cemented 7-inch casing at 5425 feet. Sunray Oil Company holds a quarter interest and Fain Drilling Company a quarter interest. Other acreage acquired by Continental Oil Company includes NW¼ 7, N½ SW 8 and jointly controls the NE¼ 8 with Sunray Oil Company. Royalty under the wildcat is selling for $800 per acre.

Structurally, this wildcat checks approximately on par with Langston pool which is productive from Second Wilcox, Marshall zone, Hunton lime and Misener sand. Only 14 feet of Mississippi lime lay above Woodford shale topped at 5080 feet. Standard tools have been moved in to replace rotary to drill plugs and test.

Vierson Oil & Gas Company et al's Leonard 1, SW SE NW 11-13n-7e, four miles west of Micawber pool, Okfuskee County, was completed for eight barrels of oil and 35 barrels of water in 24 hours through tubing for a new pool. Prue sand was shot with 60 quarts at 2606-19 feet, with hole bottomed at 3594 feet in Mississippi lime.

Two miles south of Jolly-Patton pool, Muskogee County, H. P. Curtis et al's Burford 1, NE NE 21-14n-19e, tested 150,000 feet of gas a day from sand at 570-79 feet. Rock pressure was 100 pounds.

Between East Little River and Wewoka pools, Seminole County, Weldon

Hall et al's Jackson 1-A, C N½ NE SE 14-7n-7e, pumped 81 barrels of oil in 13 hours to open a new pool. Pay is Booch sand at 3168-92 feet.

Alma Oil Company's Borden 1, NE SE NW 4-8n-8e, two miles west of Buckner pool, Seminole County, perforated Cromwell sand with 50 shots at 3310-46 feet. It tested 5 barrels of oil and 5 barrels of water in 24 hours. Pay was to be reperforated.

Paul McIntyre et al's Brown 1, SW SE NE 14-9n-7e, between East Seminole and Bethel pools, Seminole County, cemented 7-inch casing at 4300 feet in Dolomite preparatory to drilling plugs in Wilcox sand.

Two miles southeast of South Cromwell pool, Mico Oil & Gas Company had rotary rig at Davis 1, NEc 33-10n-8e, for a Wilcox-sand test.

Kansas

Stafford County Wildcat Promises Arbuckle Pool

Alf Landon et al's Shaeffer 1, C W½ NW SW 3-21-13w, three miles southwest of Hiss pool, Stafford County, promised a new pool when saturated Arbuckle lime core was recovered at 3539-42 feet with good show of oil at 3536-39 feet. Numerous oil shows also were encountered through Lansing-Kansas City lime zone at 3308-3447 feet.

Sinclair Prairie Oil Company's Gibson 1, SEc NW 29-34-3e, 2½ miles south of Bestall pool, Cowley County, swabbed 30 barrels of 35-gravity oil in 24 hours after shooting Bartlesville sand at 3367-76 feet with 40 quarts. Pumping unit was installed for a completion test.

Shell Oil Company's Ruby 1, NWc NE 35-14-13w, 2½ miles west of Greenvale pool, Russell County, recovered bleeding oil core with good porosity at 3123-28 feet. Arbuckle lime was topped at 3126 feet, and 4-inch casing cemented at 2932 feet. Plugs will be drilled when mud is bailed down.

Ewers-Simpson Oil Company's Bundy 1, C SW SW 12-9-22w, four miles east of Morel pool, Graham County, swabbed 45 barrels of fluid per hour, five barrels being 19-gravity oil and the remainder water. Hole was scheduled for abandonment in Arbuckle lime at 3869-99 feet.

Gulf Oil Corporation's Boller 1, wildcat in C E½ SE SE 29-7-22w, eight miles east of Penokee pool, filled 2800 feet with water after acidizing Arbuckle lime at 3890 feet with 1000 gallons.

Hartman & Blair's Dresback 1, C E½ SE NE 7-21-6w, extension to East Wherry pool, Rice County, pumped 48 barrels of fluid in 12 hours, 50 percent water. Mississippi lime was drilled to 3537 feet.

In Barton County, Isern Brothers et al's Lillard 1, C W½ SW SE 6-16-11w, applied 500 gallons of acid to Arbuckle lime at 3271-78 feet. Hole filled 700 feet with fluid, two-thirds water.

Benedum-Trees Oil Company's Landwehr 1, C E½ SE SE 17-32-1e, east of Wellington, Sumner County, had a fishing job at 3370 feet after topping Lansing lime at 2995 feet.

Stanolind Oil & Gas Company had rig at Nagel 1, C E½ NE SW 3-24-15w, nine miles west of Rattlesnake pool, Stafford County. Helmerich & Payne staked location for Wondra 1, SW SE NW 10-17-12w, between Wondra and Odin pools, Barton County. Republic Natural Gas Company was drilling surface hole at Radenberg 1, C W½ NW SE 8-17-11w, 2½ miles northeast of Lorraine pool, Ellsworth County.

Fain Drilling Company et al abandoned Thole 1, C E½ SE SE 23-21-12w, two miles north of Max pool, Stafford County, after encountering uncommercial production in Arbuckle lime at 3595-3680 feet.

West Texas

Crane and Pecos Counties Monopolize District Interest

Crane and Pecos counties monopolized interest in West Texas last week, with the former contributing a Permian discovery that will be passed up to try for Ordovician production. The Abell pool renewed its bid to become Pecos County's next active drilling center as result of a trio of tests showing oil from the middle Simpson sand series.

The favorable structural position previously credited to Gulf Oil Corporation's Waddell 17, C E¼ of E¼ H&TC Section 15, Block 3, Crane County wildcat on a strike between the Sand Hills and Abell areas, was substantiated when a flow of 3,242,000 feet of sulphur gas resulted from drill-stem test in Tubb lime at 4112-4227 feet. An analysis of formation samples recovered in coring the latter section showed adequate oil saturation and porosity to make an oil producer with the aid of acid, according to observers. Drilling was underway at 4470 feet to proceed to the Ordovician as originally planned. The above prospect will be the fourth producing area on the company's Waddell 45,771-acre lease. Waddell 17 is four miles south of Sand Hills field and eight miles north of the Abell pool. Top of Yates was called at 1297 feet, with an elevation of 2463 feet, being 215 feet high to Moore Bros. et al's Barnsley 1, a 6829-foot failure 2½ miles east. Combination of core drill, subsurface and geophysical information figured in the location of Waddell 17.

Culbertson & Irwin, Inc.'s Heiner 1, northern Pecos County wildcat that has been trying to make a commercial producer from Ellenberger for several months, yielded 19 barrels of fluid on 5-hour swabbing test after plugging back to 5509 feet.

Roeser & Pendleton, Inc. et al's Hayes 1, north offset to the Quito pool's wet gasser in Ward County, logged intermittent shows of gas and oil-stained Delaware sand in deepening from 5184 to 5320 feet. It will be carried 100 feet or more before testing. The appearance of 1200 feet of salt water following swabbing test at 5184 feet, with 7-inch pipe at 4912 feet, eliminated the upper Delaware as a possible source of production.

Gulf Oil Corporation's University 1-F, Crane County wildcat situated five miles west of the north end of the Church & Fields area and 10 miles east by north of the Sand Hiils field, was drilling hard Viola lime at 9490 feet. Nominal streaks of oil saturation passed up in the Devonian and Silurian beds bolsters prospects of finding production in the

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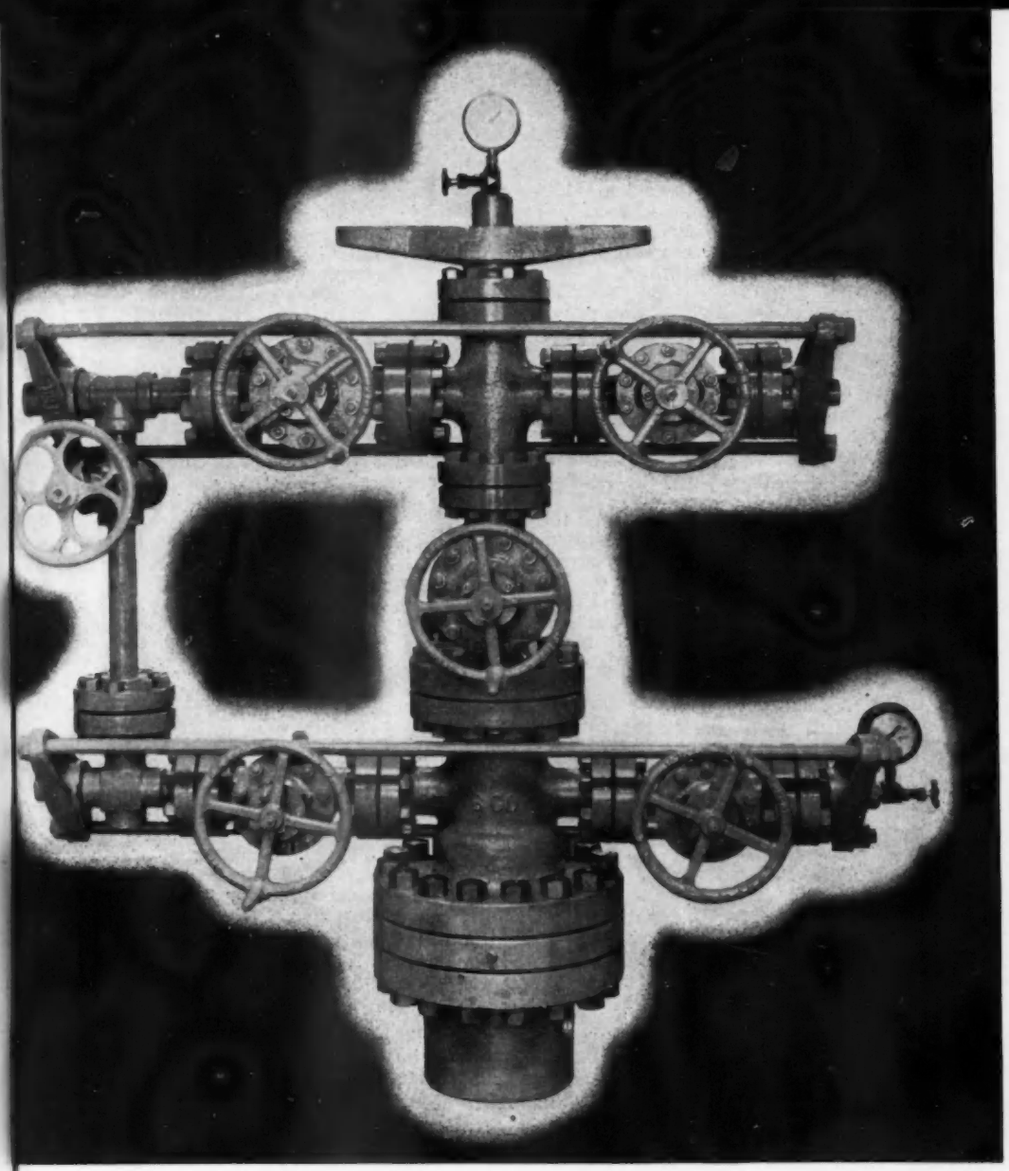

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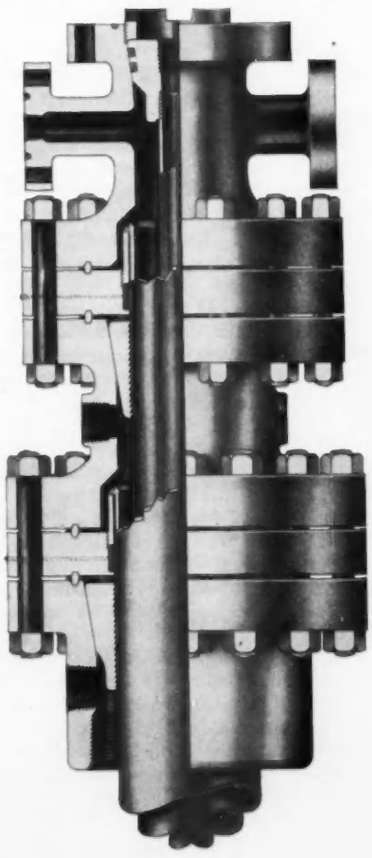

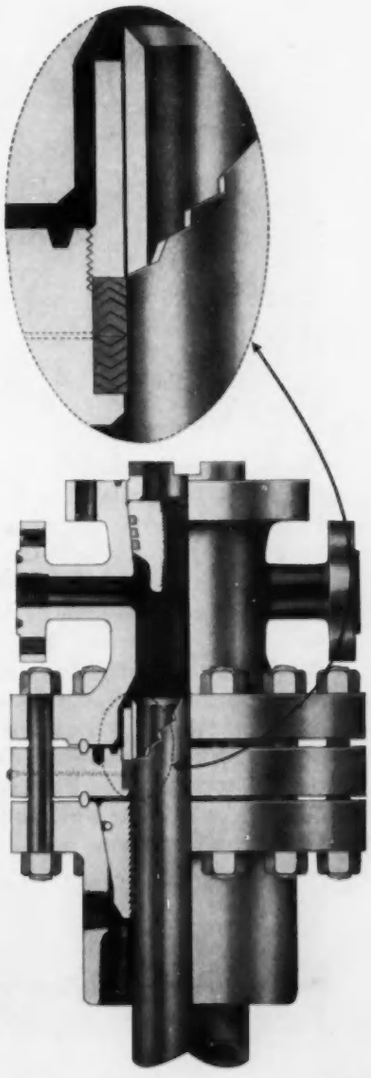

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Other assembly combinations and the complete line of Brewster Casing and Tubing Heads are shown on pages 414-19 of the new 1941 Composite Catalog.

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Simpson, or Ellenberger. It is 10 miles northwest of the company's McElroy 103, which also logged full complement of the Ordovician section, in establishing a district depth record of 12,786 feet in 1935. University 1-F found the Upper Ordovician series about 1800 feet higher than McElroy 103, while it is due to enter the Simpson, or Middle Ordovician, between 5000 and 6000 feet low when correlated with Ordovician producers in the Sand Hills field, where the Pennsylvanian and Upper Ordovician beds are absent.

Ector and Andrews Reversals

Exploration of the Clear Fork, or Holt zone in Ector and Andrews counties met with reversals the past week. Phillips Petroleum Company's University-Andrews 1, 1¼ miles northeast of the company's Embar pool gasser at 4240 feet, failed to respond to treatment with 800 gallons of acid at 5150-5510 feet after plugging back from 5741 feet. A second acid treatment was underway last week. The company's Cowden-Embar 2, ⅞ mile southeast of the gasser, was awaiting orders at 5864 feet. Stanolind Oil & Gas Company's Cowden 1-B, a mile west of its 5200-foot producer, halted at 7000 feet, having tested dry in the Clear Fork, topped at 5190 feet. Cities Service Oil Company's Addis 1, a mile west of the Addis sector of the Foster field, was drilling at 5150 feet, having failed to make a producer in the regular Permian.

Authorization of nine locations the past week by Sid Richardson to supplement an active development program already underway on his leases in the Hockley County portion of the Duggan-Slaughter field substantiates earlier predictions that the field is destined to become the most active in the district for the remainder of the year. Richardson is building a pipe line outlet to deliver oil contracted by Atlantic Refining Company. Gulf Oil Corporation's Mallet 5, south edge of the field and in Terry County, earned a potential rating of 1662 barrels of 31.4-gravity oil and 1,293,000 feet of gas after using 10,000 gallons of acid at 5040 feet.

Geo. P. Livermore, Inc.'s Ownby-Shell 1, Yoakum County semi-wildcat and three miles northeast of the Waples-Platter 2-well pool, moved off rotary after flowing 58 barrels of oil on 9-hour test from broken pay at 5227-80 feet. Hole was plugged back from water at 5294 feet.

The first of a series of wildcats scheduled to be drilled in central and eastern Crockett County as a sequel to the active lease buying given the area the past 12 months was due to be authorized shortly. J. W. Murchison et al have been assigned a block by a major operator in Blocks QR and ST for a test. Adjacent owners of short-term leases have agreed to contribute cash, or purchase spreads. In the Soma-Noelke shallow pool, M. & M. Drilling Company et al assigned to Henry Schooler and Curtis Norman development rights to the N½ and E¾ of the S¼ HE&WT Section 25, Block GG, for a test to start before March 6. The former retained sliding scale over-riding royalty, ranging from 1/4 to 1/16.

Fain-McGaha Oil Corporation et al's Julia Moore 1, a mile south of the Hawley multiple-pay pool, Jones County, is showing for a 50-barrel pumper from Hope sand at 2208-19 feet with the hole bottomed in dry sandy lime at 2225 feet. Owners hold lease on 1525 acres in the area. Pipe is set at 2198 feet to complete. The well is on the same folding that accounted for the Hawley pool production which varies from the Tannehill to the Swastika zones.

Danciger Oil & Refining Company's Kelso 2, northwest offset to the company's Flippen sand discovery in the Stith area, has set pipe to test oil saturation at 2670-73 feet after bailing test indicated commercial production.

General Crude Oil Company's Flanagan 12, second Ordovician test for the Royston pool, Fisher County, encountered water at 6128-40 feet in Ellenberger, topped at 6094 feet with an elevation of 1793 feet, and was drilling at 6180 feet. F. A. Stephenson et al's Maberry 1, recent oil strike for the McCaulley area, encountered water in deepening to 3329 feet and the hole is plugged back to 3315 feet to resume testing. The partnership's Humphries 1, 1¾ miles southwest of the above prospect, is awaiting machine to drill plugs from 7-inch pipe at 2989 feet. P. R. Long et al's Davidson 1, 2½ miles northwest of the original prospect, logged oil saturation at 3266-72 feet, and set 7-inch pipe at 3255 feet after drilling to 3279 feet.

Shell Oil Company's Rutherford 1, northwest offset to its Aspermont pool discovery in Stonewall County, drilled plugs from 5½-inch pipe at 6197 feet, and conditioned hole preparatory to acidizing thin section of oil saturation in Ellenberger at 6197-6239 feet.

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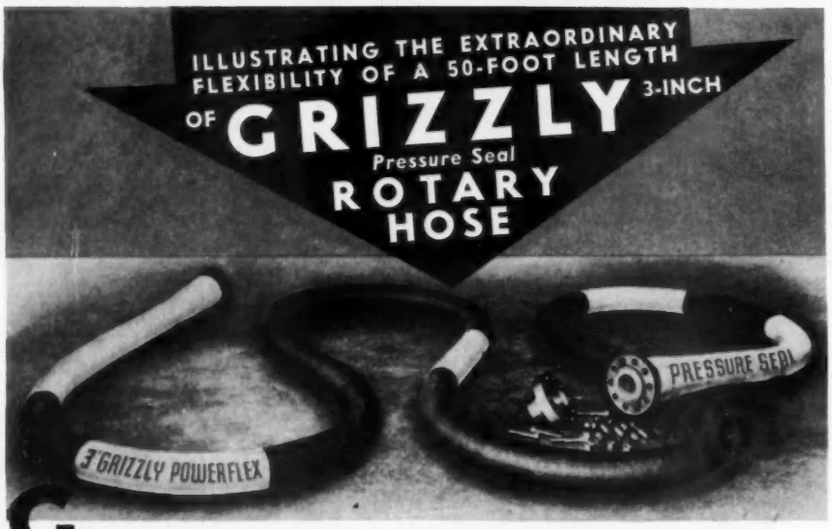
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North Texas

Griffin-Kadane Extension Try Fails in 4300-Foot Strawn

Initial efforts to widen the Griffin-Kadane pool, northwestern Archer County, to the northeast failed when Petroleum Producers Company and Deep Oil Development Company's Lynch 1, SEc SW Palo Pinto County School Section 20, a mile from production, proved dry in the 4300-foot Strawn series. The test was drilling at 4490 feet, and was due to continue to the Ellenberger, productive in the southwest portion of the K-M-A field. Eph Griffin et al's Fee 1-A, NWc SW Section 14, an intermediate test, was drilling at 4310 feet, and Deep Oil Development Company and Eddie Kadane's Griffin 1, between the original deep area and the east extension, was drilling at 4350 feet. Lease owners in the area have projected an ambitious drilling program, subject to expansion of the producing territory.

Helmerich & Payne, Inc.'s Wilson 1-A, west edge of the Hull-Silk field, flowed 66 barrels of oil on one-hour potential gauge through ¾-inch choke after using 5000 gallons of acid at 4607-4624 feet in Bend, topped at 4606 feet. Shappell Oil Company's Lyles 15, NEc NW Section 7, Hooper-Wade Survey, a mile southwest of the Mankins deep pool, was abandoned at 4875 feet in Bend, topped at 4830 feet, or 100 feet lower than nearest producers. Magnolia Petroleum Company's Hayter 1, projected Ordovician test for Southwestern Archer County, tested water in promising sand at 1395-1408 feet, and was drilling at 1580 feet.

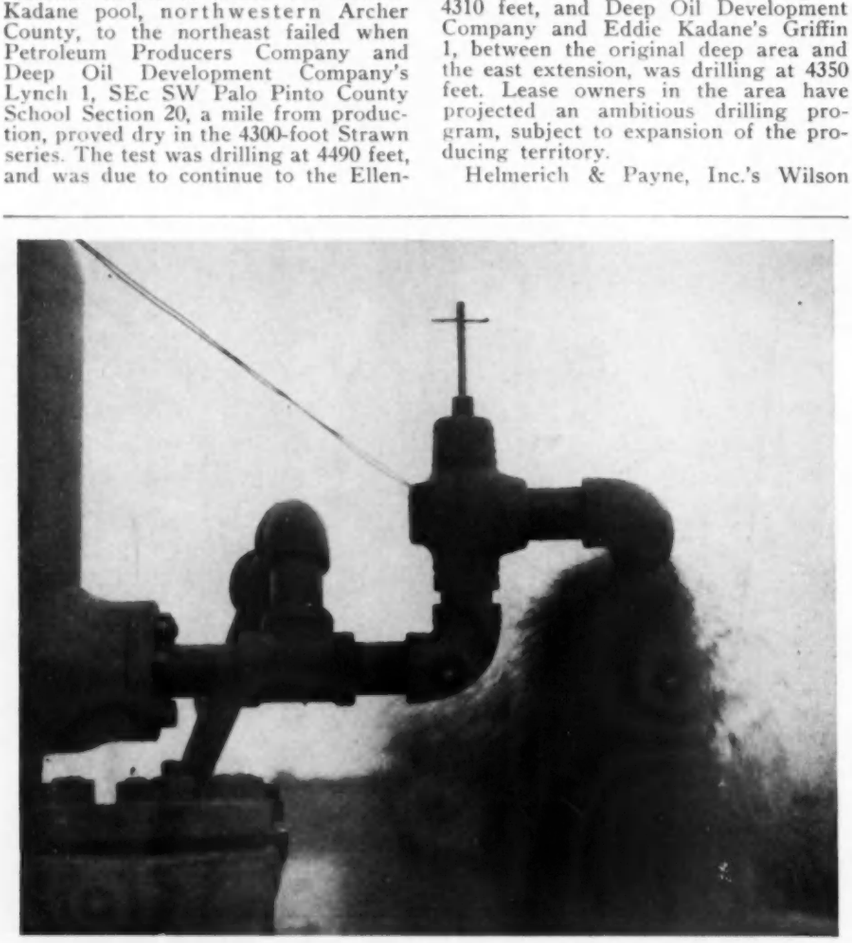
Amerada Petroleum Corporation's Harrell-Magnolia 1, southeast edge test for the Fargo pool, Wilbarger County, logged Basal Canyon sand at 3931-45 feet, and flowed oil in pits when formation tester was used at 3927-47 feet. Drilling was under way at 4125 feet to explore the Strawn series. The company's Folley Unit 1, southwest outpost, failed to produce in Strawn at 4669 feet, and will plug back to 4400 feet to run pipe and perforate opposite saturation at 4246-74 feet and in Canyon at 3986-3899 feet.

Exploratory work in the Fort Worth Syncline has been curtailed as result of a series of deep failures drilled at random as a sequel to the major lease play that was staged early last spring. The north and west portions of the syncline accounted for oil strikes in the Strawn and Bend series, thereby lending encouragement to follow-up wildcat operations. Participants in the lease campaign are gathering helpful subsurface information from the initial wildcat efforts, and expect to employ geophysics with greater effectiveness in the future. The general area between Fort Worth and the old Petrolia field involves numerous lease blocks that will be tested within the next four years.

In Tarrant County, Bruce Sullivan, Hill et al's Putnam 1, 2 miles northeast of Saginaw, quit in Ellenberger at 7695-7836 feet. No shows of any consequence were recorded. It is credited with having entered the Viola lime, upper Ordovician, at 7463 feet, and top of Simpson at 7563 feet. J. G. Hammond, Inc.'s Jester 1, near Ballard, Montague County, quit in brown lime at 7174 feet, having logged top of Bend at 6282 feet and first Barnett shale at 6850 feet. Stringer of Mississippian lime was tentatively called at 6880 feet.

Gulf Oil Corporation's Worsham-Spring 4, west edge of the Ringgold pool, tested salt water in Lower Bend at 5876 feet, and was coring at 5905 feet to explore the Ellenberger. Other operators in the 8-well pool have stacked their rigs, although the area offers possibilities of extending to the east. W. B. Omohundro et al's Parr 1, northwestern Montague County wildcat and five miles northwest of the Ringgold pool, was drilling at 5690 feet.

Continental Oil Company's Robertson 1, Jack County wildcat that originally showed for a producer last December near the Mississippian-Ellenberger contact at 5345-80 feet, produced 55 barrels oil on 7-hour swabbing test after 55-quart nitro shot at 5355-80 feet. The hole was plugged back from 5577 to 5381 feet. The company's Johnson 1, ¼-mile southeast of the above operation, was drilling at 4820 feet, having proved dry in the Marble Falls, topped at 4415 feet.



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East Texas

Chapel Hill Area Extended Half-Mile Northeast

A half-mile northeast extension was given the Chapel Hill field, Smith County, when Shell Oil Company's Browning 1 flowed 276 barrels of oil initial through ⅜-inch tubing choke with 1350 pounds working pressure on casing and 300 pounds on tubing. The flow followed treatment with 2000 gallons of acid through casing perforations at 8290-8300 feet in Pettit topped at 8130 feet with an elevation of 425 feet. Browning 1 was carried to barren Travis Peak section at 8343-55 feet before landing 5½-inch pipe 1 foot off bottom. It is the fourth oil producer from the Pettit, all on the northeast dip of the structure, and established a new producing depth record by a narrow margin for the Woodbine belt. Three additional tests are under way in the north end of the field.

Fourth oil producer for the townsite sector of the Hawkins field, Wood County, was due late last week at Gene Germany and Bill Shield's Minchew 1, Block 28, with pipe cemented on bottom at 4818 feet. It is credited with having logged an aggregate of 270 feet of oil saturation after entering the Woodbine at 4492 feet with an elevation of 407 feet.

The western limits of production in the Hawkins field remained undetermined late last week after A. A. Folsom et al's Prince 1, 6900 feet west by north of nearest townsite production, failed to show oil, gas or water on drill-stem test at 4883 feet. Top of Woodbine series was called at 4699 feet, with an elevation of 390 feet, being 311 feet lower than nearest production but 57 feet high to the discovery pumper. Red Iron Drilling Company is reported to be planning to take over the test to run pipe and test broken oil saturation recovered in upper Woodbine. Shale predominated in the Woodbine section, thus accounting for the adverse performance of the outpost.

Inability of owners of small drilling sites and lots within and adjacent to the prolific townsite area to obtain prompt action on applications for well-spacing exceptions has greatly curbed interest among independents. Applications covering 64 exceptions were booked by the commission for the February 11-24 period. However, 11 drilling permits were issued early last week.

Delta Drilling Company and Sells Petroleum Inc.'s Beckham 1, Wood County wildcat on the Haynesville salt plug, abandoned at 7501 feet in shale. It is credited with having quit above the Woodbine.

Gulf Oil Corporation's Venters 1, west offset to the Camp County deep oil discovery, was undergoing swabbing test wtih 2600 feet of fluid in hole after using 1000 gallons of acid mud. This test was plugged back from Travis Peak at 8107 feet to 8048 feet before landing liner with perforations opposite saturation at 7932-69 feet and 8009-8039 feet.

Sun Oil Company's Henderson-Republic 1, projected Lower Trinity test for the Ore City prospect, was drilling lime at 4600 feet, having logged top of Woodbine at 3688 feet and Georgetown lime at 3792 feet with an elevation of 281 feet.

Skelly Oil Company's Markey 1, deep test for the Mount Enterprise faulted structure, Rusk County, was drilling at 3680 feet. Pecan chalk was called at 2440-2910 feet and Austin chalk at 3352-3540 feet with an elevation of 497 feet.

Texas Permits

The Texas Railroad Commission last week issued permits for drilling 189 wells, 36 less than were authorized the week before.

Operators in the East Texas field were allowed to drill 10 wells, with four in Upshur and two each in Gregg, Rusk and Smith counties, while 14 locations were reported from the remainder of the East Central Texas area.

There were 35 permits granted in West Texas, including 11 in Hockley County,, and West Central Texas producers were allowed 12 locations. From the North Texas district 42 permits were listed, including 18 in Archer County, while nine were authorized in the Panhandle.

Leading the state for several consecutive weeks was Southwest Texas with 45 permits, including 10 in Nueces County. There were 22 locations approved in the Gulf Coast District.

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Southwest Texas

Jackson County Apparently Has Another Field in Making

Wildcat ventures are meeting with various degrees of success in several South Texas Gulf Coast counties. Jackson County appeared to have a new shallow field in the making, while deep tests were making production attempts elsewhere.

W. S. Boyle, John W. Mayo and C. A. Wright's Terrell 1 was plugged back from just below 6000 feet, 5½-inch casing set at 4010 feet and preparations were made for the first of a series of tests up the hole. The first will be in a 3800-foot sand, likely in the Catahoula zone. Electric log and side wall samples were reportedly encouraging. The well is on a 2000-acre block and is 8 miles northwest of Edna in Jackson County, William Murphy Survey.

Humble Oil & Refining Company's St. Charles-State 1, Tract 27, of St. Charles Bay, Aransas County, will attempt to widen the Lamar field about 7000 feet northeast with a new sand. It was bottomed at 10,347 feet, but casing was only run to around 8350 feet. It is expected that the main sand to be tested is at 8294-8308 feet. The producing level in the lone producer in the field is at 7500-7650 feet.

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Continental Oil Company recovered salt water through perforations at 9295-9305 feet in St. Charles 3, on the St. Charles prospect in Aransas County. It will be tested at a higher level.

Submerged Drilling

Drilling in submerged sectors of the South Texas Gulf Coast is at the highest level in history with nine wells drilling or due to be commenced immediately. These include seven wildcats or tests below the regular producing levels in the fields in which they are located. Of particular interest, the submerged wells are all projected to extreme depths, generally in excess of 10,000 feet. The newest ones, located during the week, are two for Gulfboard Oil Corporation in Tracts 114 and 117 in San Antonio Bay, Calhoun County, and another for Humble Oil & Refining Company in Tract 246, Aransas Bay, in Aransas County.

Humble Oil & Refining Company is drilling two very deep tests in the East Flour Bluff field, a submerged area in Nueces County. Flour Bluff-State 6-D, Tract 30, was at 8570 feet, while Flour Bluff-State 1-J was below 7385 feet. The field's producing level is at 6800 feet.

Skelly Oil Company's State 1, Tract 388, in Laguna de los Almos, and just south of the Baffins Bay field in Kenedy County, was making hole near 9900 feet, deepest well in the area.

Two operations, one by W. R. R. Oil Company and the other by the Sinclair Prairie Oil Company, are active in the East White Point Sector of Nueces County.

McFaddin field's south flank production in Refugio County is due for an extension of nearly a half mile south as C. L. Norsworthy prepares to complete Fred Fagan 3 in a sand at 5602-20 feet. The hole is bottomed at 5848 feet with casing set at 5746 feet. It will be finished through perforations.

LaSalle County

William H. Spice, Jr.'s D. C. Reed 1, LaSalle County wildcat, topped the Carrizo and Wilcox formations practically flat with the Washburn field production, six miles northwest. After running electric log at 4518 feet, it was being cored below 4720 feet in search of the Washburn sands. This wildcat, in T. Conlan Survey No. 124, encountered the Carrizo zone at 3282 feet and the Wilcox formation at 3580 feet. The Washburn discovery found the Wilcox marker at 3612 feet. In the producing well, broken sand with oil odor was found at 4740-4824 feet. A second sand was encountered at 4865-75 feet. It was in this pay that the test was finished last year to uncover the first up-dip production in South Texas Wilcox trend. The other two pays in the Washburn 1 were at 5060-69 feet and 5415-30 feet.

Edwin M. Jones' West B-3, on the George West prospect in Live Oak County, was progressing close to the 8387-foot level where B-2 blew out several months ago and made gas and distillate through drill stem. The B-2, several miles to the east, however, was abandoned.

W. R. Davis, Inc.'s Albrecht 2-C, north outpost to the Weser field in Goliad County, is drilling below 6525 feet, headed to the Wilcox formation. This is the first deep test to be drilled on this structure, which already has Cook Mountain and Yegua production.

Texas Gulf Coast

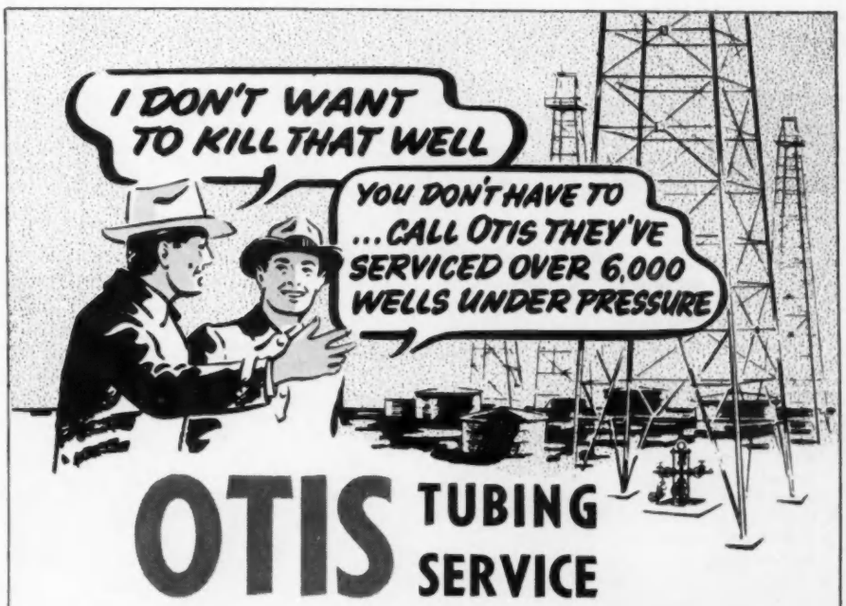
Halls Bayou Becomes New Frio Oil Field

Frio successes led the week's news, with Strake Petroleum Corporation establishing a new field in that formation at Halls Bayou, Brazoria County, and Humble Oil & Refining Company finding a new Frio oil sand in the Red Fish Reef field in Galveston Bay, Chambers County. There was no climax in Wilcox activity, as Superior Oil Company of California continued to test the recent discovery in the Lake Creek field, east of Magnolia, Montgomery County.

The Strake Petroleum Corporation discovery, Griffith 1, H. P. Cayce Survey, Brazoria County, three miles southwest of Alta Loma field, Galveston County, flowed at rate of 486 barrels of yellow 47.7-gravity oil daily on 30-minute drill-stem test, using ⅛-inch chokes, from perforations just above casing seat at 10,325 feet. Salt water content was 10 percent, presumably due to lack of seal around shoe, with flowing pressure 3925 pounds. The wildcat, which has exhibited phenomenal surface pressures, requiring 15-pound mud for control, was killed with 5500 pounds pressure for a squeeze job on the perforations, recementing of casing, and further testing, possibly in open hole from 10,325 feet to bottom at 10,333 feet. Shut-in pressure was 5000 pounds at the surface, indicating bottom-hole pressure in excess of 10,000 pounds. The test was drilled on company's 2100-acre block with Alta Loma Frio as objective, topped upper markers high compared with Alta Loma, attempted to blow out from 8050 feet, went into down-dip, down-throw side of fault, and topped Marginulina 750 feet lower than Alta Loma wells. Marginulina interval was 450 feet greater than at Alta Loma, with Frio topped at 10,288 feet, where the well again attempted to blow out, requiring compounding of mud and cement pumps to control, and extreme caution in running casing and tubing. The discovery is the third for 1941 in the upper Texas coastal area, first being J. Newton Rayzor's Christian 1, at Chenango, central Brazoria County, second being Superior Oil Company's McWhorter 1, Wilcox strike at Lake Creek, Montgomery County. Humble Oil & Refining Company appears to be well situated with respect to the Halls Bayou discovery, holding about 10,000 acres to the west, all taken on geophysical work done in the Rattlesnake Mound area last year.

Humble Oil & Refining Company enhanced the importance of the Red Fish Reef field, Galveston Bay, Chambers County, by discovery of a new deep sand in the Frio at 10,990 feet, deepest for the field and the second oil sand, as well as the fourth productive level. Each of five successful completions in the field, except one, have discovered new sands. The company apparently will make a going commercial proposition of this 1940 discovery, which is being developed against large economic odds due to high cost of marine drilling, storage and transportation. Well in newest sand was State 9-A-263, a mile southwest of the company's State 3-A-248, first oil sand discovery, flowing 4 barrels of 34.5-gravity oil hourly via ⅛-inch choke, from perforations at 10,990-995 feet. Tubing pressure was 1500 pounds. Company was unsuccessful in opening a new sand at 10,760-780 feet in State 8-A-233, recovering gas at high pressure, but had some success at 9375 feet, where another new sand was cleaning into pits, with no data on production. The field now has distillate zones at 8814 and 9941 feet, and oil horizons at 10,327 and 10,990 feet.

Gulf Oil Corporation's State 1-R-224, north offset to the discovery at Red Fish Reef, was prepared for test through perforations at 10,506-511 feet, with 5-inch liner on bottom at 11,000 feet. Other wells drilling were Humble Oil & Refining Company's State A-5, past 10,380 feet; State A-10, past 9761 feet, and State A-16, waiting on cement at 3034 feet. Deeper drilling will be the practice in the field, as Humble Oil & Refining Company requested permit to carry wells 9-A, 5-A and 8-A to 12,000 feet, and projected two new tests to 11,000 feet, these wells being State 19-A-247, 1420 feet southwest of 16-A-242, and State 18-A-248, 1320 feet southwest of 3-A-248. This rapid campaign is induced by the necessity of obtaining production on each separate state tract to avoid surrender in 1941-42. With the volume of activity in this and other deep coastal fields, Old Ocean, Chocolate Bayou, and other Brazoria County distillate areas, the average depth per well is expected to increase materially in 1941.



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Louisiana Gulf Coast

Gabriel Prospect Provides District's Second 1940 Field

Titanic Oil Company established the St. Gabriel prospect, Iberville Parish, near the Mississippi River, as South Louisiana's second 1940 discovery by testing Natalbany Lumber Company 1, Section 7-9s-2e, at 7766-76 feet, obtaining flow of 250 barrels of 30.1-gravity oil daily via 9/64-inch choke, with tubing and casing pressures 2370 and 2790 pounds. This was not a final completion, the possibility existing that tests will be made in four other sands before official gauge is taken. The strike is the company's second in a month, first being the Westwego field in Jefferson Parish.

The wildcat, third for the prospect, cored gas and distillate sand at 6875-98 feet, oil sand at 7752-78 and 7781-95 feet, with another sand reported near bottom of hole at 9026 feet. Electrolog showed two other sands between 7700 and 9000 feet, with one of them probably correlating with the 9000-foot sand which showed for production in Shell Oil Company's Natalbany Lumber Company 1, failure ¾-mile southeast. The Titanic Oil Company test, Shell Oil Company farmout, checked 200 feet high on this dry hole.

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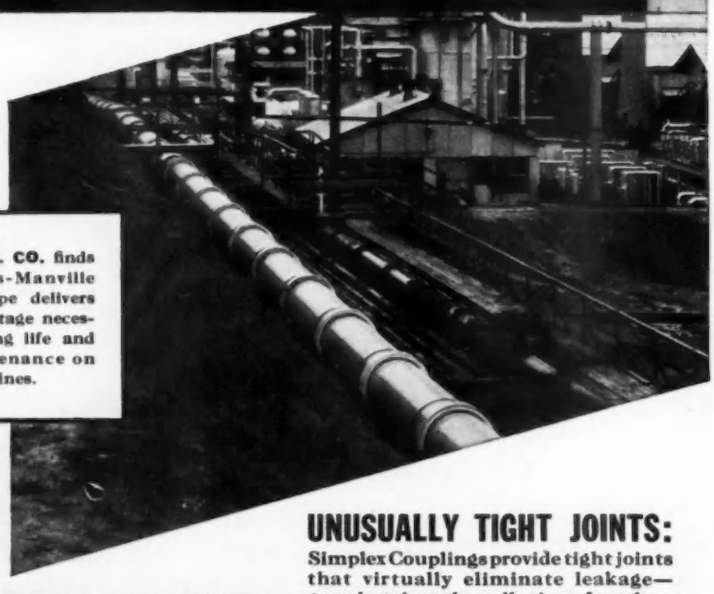

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TRANSITE PRESSURE PIPE
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Prospect was found by Shell Oil Company with reflection seismograph in 1936, the company drilling two failures, each of which attempted to blow out from 9000-9200 feet, and credited with strong production possibilities. Original shooting picture showed 400 feet of closure, with a stiff drilling obligation being the only factor retarding development.

Lakeside prospect, northwest of Grand Lake, Cameron Parish, was the week's disappointment with failure to produce satisfactorily from a 10,055-060-foot section in Lisbon-Iberia Oil Company's Calcasieu National Bank 1-A, which indicated strong possibility of commercial production on initial test. On second test, hole sanded up, but failed to yield much distillate when cleaned out. Operator perforated for test at 9990-10,006 feet in a portion of the same sand member which showed 3½ ohms, 18 mv on electrolog. On previous test, lower in the section, the well made 210 barrels of 57-gravity distillate in 76 hours, via various chokes, with pressures varying from 2500 to 3100 pounds. Saturation was logged at 8730-48, 8220-28, 9518-60, 9798-840, and 9972-10,060 feet. All sands showed gas caps, with only one, that at 9518-60 feet, showing oil-water contact.

Gulf Oil Corporation was rebuilding derrick and repairing rig on Buras Levee District E-2, Section 35-22s-30e, West Bay field, Plaquemines Parish, after last week's blowout and fire. Well blew out while running casing, with casing 30 feet off bottom at 7286 feet, due to failure of float valve or casing collapse. The flow caught fire, but was extinguished by a head of shale, the well being controlled three days later. Tide Water Associated Oil Company's State 1-451 was drilling at 4585 feet, after being delayed by the blowout. State 1-451 is north offset to Timolat 1, discovery in the 7200-foot sand which caused the blowout.

Titanic Oil Company killed, and reperforated for production test, Marrero Land Company 1, Section 3-13s-23e, Jefferson Parish, discovery of the Westwego field across the river from New Orleans. Discovery was made a month ago, flowing 238 barrels of 30.3-gravity oil daily, with 150 barrels of salt water, from 9830-42 feet, via 7/64-inch choke, with tubing and casing pressures 2250 and 2750 pounds. Salt water increased to 40 percent, forcing the workover. New test will be in the same section. Reese Carter's Craven Community 1, confirmation test ¼-mile east, was drilling near 4000 feet.

At South Crowley, Acadia Parish, Humble Oil & Refining Company tested Jeffers 1, Section 23-10s-1e, at 8830-35 feet, recovering oil and salt water on test. The test was plugged back, perforated at 8155 feet, and yielded another unsuccessful test. These sands were not good enough for completion where entcountered by the company's previous three producers in this abandoned semi-commercial field, restored in 1940. In the Cameron Meadows field, Cameron Parish, Magnolia Petroleum Company scored a short extension with Cameron Meadows 30, Section 12-14s-13w, perforated at 5712-22 feet, flowing 388 barrels daily via ¼-inch choke. Continental Oil Company's test of Motty 1, Section 18-12s-3e, west of Abbeville production in Vermilion Parish, was watched with interest, although no information was available on tests made in a 10,315-foot sand which has provided one producer. It was not believed that the company would have run casing if indications pointed to a high gas/oil ratio well.

North Louisiana

Deep Test Plugs Back For Smackover-Lime Test

North Louisiana's deepest test, Union Producing Company's Meadows A-1, C NE 18-21n-4w, Claiborne Parish 2½ miles north of production at Lisbon, drilled into Permian salt at 11,829 feet last week, and after going to 11,834 feet, plugged back for a test in the Smackover lime. Salt was topped in a core from 11,817-834 feet. After running electric log, hole was plugged back and a drill-stem test made from 10,393 to 11,834 feet. With ¼-inch chokes at top and bottom and with tool open one hour and 54 minutes, only 87 stands of gas-cut mud showed. Maximum pressure was 105 pounds. Operators planned a further test in this Smackover-lime horizon. Considerable wet gas showed during drilling at 10,394 feet.

Louark Producing Company's Louisiana Delta Lumber Company 1, C SW SE 27-6n-4e, LaSalle Parish wildcat, logged a show of heavy asphaltic oil at 3170-85 feet, but deepened below 4201 feet. This is the first of a series of wildcat tests planned for Wilcox exploration on the Olla trend by this company. Four other wildcats are drilling on this trend, deepest of which is H. L. Hunt's Lancaster 1, SEc 3-14n-12e, Madison Parish.

W. H. Rowe, discoverer of the old Homer field, and George H. Hindman, both of Shreveport, assigned a wildcat block in Townships 8 and 9 north, Range 6 west, Winn Parish, to Z. T. Longoria for a test to spud by March 20. H. L. Hunt was reported adding to a wildcat block in Jackson Parish near Jonesboro, in Township 15 north, Range 2 west.

H. L. Hunt, discoverer of the Nebo-Jena Wilcox field in LaSalle Parish added three new oil wells in that area last week. A wildcat in Tensas Parish was abandoned.

E. T. Oakes, of Shreveport, discoverer of the Lisbon field, completed a 6000-acre wildcat block south and west of the Joaquin gas field, Shelby County, Texas.

Two East Texas wildcat locations were made. In the Smithland townsite, Marion County, Henry King et al moved in materials for W. G. Bailey 1, Robert Maxwell and H. N. Allen surveys. Two miles southwest of Avinger near the Gas-Marion County line, Cross Roads Oil Company made location for Sam Orr 1, proposed for a 7000-foot test.

Arkansas

Columbia Wildcat Continues Try for Travis Peak Oil

Turner and O'Farrell's Smart 1, SW SW 12-15-20, Columbia County, on the northwest edge of the old shallow Stephens field, which for a while flowed a small stream of oil with wash water after casing was perforated with 24 shots in the Travis Peak at 3417-25 feet, later ceased to flow, and when swabbed showed salt water. Operators squeezed off perforations and planned another test with installation of pumping equipment. Arkansas so far has no Travis Peak production.

In the 9200-9300-foot McKamie gas/distillate field, LaFayette County, Barnsdall Oil Company's R. Cornelius 1, SW NW 28-17-23, cored for saturation in the Smackover lime at 9185-9205 feet, after topping Smackover at 9172 feet (elevation 272 feet). In this field, Atlantic Refining Company's Bodcaw Lumber Company 3, NE SE 29-17-23, was drilling at 7964 feet, and Bodcaw Lumber Company 4, SW SW 28-17-23, was drilling at 7562 feet.

Shell Oil Company washed in W. P. Keith 2, SW SE 9-18-22, at Dorcheat, which topped Smackover lime porosity at 8822 feet (elevation 219 feet). One new location was made at Dorcheat, Louark Producing Company's Miller County wildcat, Hedrick 1, C SE NE 27-19-27, drilling at 2375 feet after topping Nacatoch at 1857 feet.

Southeastern States

Tinsley Dome Receives One Well, Seven New Locations

Seven new locations were staked last week in the Tinsley Dome field, Yazoo County, Mississippi, which also accounted for the state's single completion for the period. Hassie Hunt made four new locations, Union Producing Company two, and Slick-Urschel Oil Company one.

Union Producing Company's southwest edge test at Tinsley Dome, V. M. Perry 1, SE 23-10n-3w, showed for a producer after casing was perforated with 98 shots at 4586-4606 feet and 2⅞-inch tubing was swung at 4586 feet. Total depth is 4637 feet. A 10-minute drill-stem test, with ¼-inch chokes at top and bottom and tool set at 4578 feet, showed 2700 feet of oil with eleven pounds pressure and 750 pounds bottom-hole pressure. Seven-inch casing was set on bottom.

British American Oil Company has let contract to Big West Drilling Company, Dallas, for wildcat test on a block in Sharkey County, Mississippi, near where this company recently abandoned Houston Estate 1, N½ NE 23-11n-7w, at 4027 feet. New location had not been staked due to difficulty in reaching the tract.

Humble Oil & Refining Company was moving several geophysical units to Evergreen, Alabama, for extensive work on its recently acquired blocks in Conecuh, Washington, Mobile and Escambia counties. Westbrook, Thompson and Stewart have been leasing recently in Escambia County, Alabama, and in Escambia and Santa Rosa counties, Florida.

A branch office for research into possibilities of mineral development in South Georgia has been opened at Waycross by Garland Peyton, director of the Georgia State Geological Survey, and Robert C. Beckstrom, a geologist and state WPA supervisor. An oil geologist, paleontologist and mineralogist, with laboratory equipment, are at Waycross.

Amerada Petroleum Corporation recently transferred a seismograph unit working out of Tuscaloosa, Alabama, to East Texas.

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Good Oil Well to Intensify Clare County Development

Sun Oil Company's completion of State-Strange 1, C N½ NW SW 36-20n-6w, Clare County, which flowed natural 180 barrels through a ¼-inch tubing choke the fourth day on test, is expected to intensify development in Winterfield Township, and stands as the most encouraging development of the year. The well is 1320 feet east, a 20-acre location offset, to the same company's State 1, completed last fall as a discovery for 46 barrels a day natural. The Pure Oil Company offset it to the west with a dry hole.

State-Strange was nine feet higher on the Dundee, logged at 3784 feet, than the discovery, and bottomed at 3791 feet. Coupled with development three miles west in the same township, where two producers have been completed in the same horizon and a third in a shallower zone, the Traverse, Winterfield is now looked upon as the area likely to receive active exploration this spring.

Sun Oil Company, the most active wildcatting company in the state, resumed deepening operations on McIntosh 1, C S SW NE 16-19n-3w, Clare County, after spooling a new 6000-foot drilling line. Test was drilling at 5286 feet in the Sylvania series, but at that depth had not logged the Big Sylvania white sandstone, objective of the test. It is the deepest test ever drilled in Clare County, and may be a decisive factor in determining whether or not the company makes a 10,000-foot test in the district this summer.

Eugene Hilliard's State 1, Section 19-21n-3w, Roscommon County, continued shut down for orders at 4107 feet, where water was logged in the Dundee. It may be plugged back to 4045-47 feet, where a free oil show was reported.

The Pure Oil Company was drilling below 3215 feet in State A-2, Section 15-19n-3e, ½ mile northwest of Dundee-lime (2800-2900-foot) production in the Adams field, Arenac County. The test is scheduled for the Monroe horizon, first for the area.

Gulf Refining Company recovered 5420 feet of the 4½-inch drill pipe from Bateson 1, Section 2-14n-4e, Bay County, the state's deepest well at 7776 feet, and appeared to be in a good position to clean up the hole within the next 10 days. Pipe was being removed by running a cutter on special 2⅜-inch drill pipe inside the old stand, with the sections thus freed removed by fishing with an overshot. Operations to recover the full drilling string started January 21. The well has been down since December 28, following a blowout at 7776 feet that was followed by fire seven days later, wrecking the derrick and rotary rig.

California

Twenty-Acre Spacing Dropped By Ten Sections Operator

In the Ten Sections field of Kern County, Shell Oil Company abandoned its 20-acre spacing program for the first time in staking location for KCL 35-29, on a 10-acre spacing basis. No definite indication has been given by the company as to future operations. In the development of all new deep fields in the San Joaquin Valley, operators held to the 20-acre spacing program. The company's apparent decision to drill on the smaller unit basis at Ten Sections may lead to similar action in other fields in the territory, including Greeley, Rio Bravo, Cole's Levee, Strand and Paloma. Several factors offer inducement to closer drilling in these fields, foremost of which is determination of allowable under the state's voluntary proration program entirely on a well basis. At the same time, Shell Oil Company may have decided 20-acre spacing would not properly drain the structure. Over the past year, the company has undertaken extensive experimental work with slim-hole drilling, and reportedly has made heavy reductions in drilling expenses. This may have also contributed to the decision to reduce spacing.

For more than a year, Shell Oil Company has been operating eight strings of tools in California, and there is no change reported in this drilling program. Heavy drilling during 1940, however, made serious inroads to drillable proven acreage remaining to many companies, and brought a slackening of activity in the latter part of 1940. With the end of proven drill locations now in immediate prospect, many of the companies who have developed holdings on a liberal spacing basis may give consideration to the drilling of inside locations during 1941. Shell Oil Company may be leading in this movement.

Western Gulf Oil Company was coring in shale below 10,714 feet in KCL B12-12, northwestern outpost in the Paloma field, after having cored shale with streaks of light oil sand similar to the productive sands of the main portion of the field from 10,248-685 feet. Formation test on the interval resulted in a flow of 570 barrels daily of 53-gravity oil and nearly 4,000,000 feet of gas. Production was believed to be from Stevens zone, at this point above the main productive interval in the area.

About midway between the northwestern limits of the Wilmington field and the southeast limits of the Harbor City field, in the Los Angeles Harbor district, Acoma Oil Company's No. 1, wildcat, was standing cemented over the Terminal zone at 3400 feet, with bottom at 3750 feet. Pay horizon was cored about 100 feet higher than in the outpost location of the Harbor City field.

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UNITED STATES WELL COMPLETIONS

Arkansas

Nevada County (Troy)—
Berry Asphalt Co., Fincher 4, 10-14-20 ..... 20 1259

Union County (Rainbow City-Champagnolle)—
Curtis Kinard et al, Gregory 1, 15-17-14 ..... * 2890

Union County (Smackover)—
Bob Milam, Childs 2, 8-16-16..... 65 2635

Woodruff County (Wildcat)—
Tatum & Watkins, Miller 1, 7-5n-2w * 1770

California

Fresno County (Coalinga-Northeast)—
Superior, Husong 6.....1200 8197

Kern County (Belridge)—
Belridge Oil Co., No. 9-1..... 400 8387

Kern County (Coles Levee)—
Richfield, KCL-A 14-29..... 600 9380

Kern County (Kern Front)—
McDonald & Dearin, No. 7..... 150 1830

Kern County (Paloma)—
Ohio, KCL-A 9-83-4 .....1220 10,340

Los Angeles County (Santa Fe Springs)—
Union, Bell 103 ..... 850 2525

Orange County (Brea-Olinda)—
Birch Oil Co., No. 16..... 100 3413

Santa Barbara County (Gato Ridge)—
Petrol Corp., Tognazzini 3-15..... 245 4696

Ventura County (Ventura Avenue)—
Shell, Taylor 132.....2667 8255

OLD WELLS DEEPENED

Fresno County (Kettleman Hills)—
Standard, No. 76-19J (otd 8620).. 298 11,100

Kern County (Canal)—
Ohio, KCL E-5 (otd 8173).....1228 8419

Kern County (Ten Sections)—
Shell, KCL B-34-28 (otd 8196)... 61 8220

Los Angeles County (Long Beach)—
Shell, Cresson 8 (otd 881)..... 121 5901
Pickler 6 (otd 4050)..... 169 4989

Los Angeles County (Seal Beach)—
Continental, Bixby 16 (otd 1552).. 566 4720

*Failures; †Junked; ¶Million cu. ft. gas.

Illinois

Clinton County—
Kreigh et al, Kampworth 1, nec nw nw 8-1n-3w 10 1000

Edwards County—
J. D. Baines, Hodgson 1, n½ n½ ne 1-2s-10e ..... * 2900

Fayette County—
Carter, Lancaster 2, se ne nw 10-8n-3e 24 1555
Magnolia, Carter-Watson Unit 1, ne se se 33-8n-3e 132 1587

Franklin County—
E. L. Shoudy, Ziegler Coal Co. 1, nw sw ne nw 14-7s-1e..... * 950

Hamilton County—
Exchange, Abbott 2, nec sw 27-5s-6e ..... -50 3062
Friel 14, sw nw sw 35-5s-6e..... 80 2960
Roy Power et al, Schoolhouse 1, sec ne nw 34-5s-6e 30 3025
Mammoth P & R, Jackson 2, sw nw sw nw 35-5s-6e 50 3050
Carter, Grimes 1, nw sw nw, 2-6s-6e 389 3055
Texas, Edward 7, sw se ne 3-6s-6e (pb 2962) 300 3063
Hood 3, c sw sw ne 3-6s-6e (pb 3064) 200 3066
Hood 7, c se sw ne 3-6s-6e (pb 2964) 250 3059
Howell 1, ne ne sw 3-6s-6e (pb 2990) 257 3087

Jasper County—
Pure, Hemrick 2, e½ ne se 32-6n-10e 203 2885

Madison County—
Wickwire & Tomberlin, Ellis 1, e½ nw se 22-3n-6w ..... * 1410

Marion County—
Hollingsworth, Kalkbrenner 14, nw se se sw 5-1n-2e 125 3490
Shell, Ververs 8, n½ ne nw 18-3n-1e 223 1436

Montgomery County—
Lacy et al, Luddeke 1, se nw nw 28-9n-4w ..... * 1801

Richland County—
O'Meara, Lanier 1, sw sw ne 24-4n-9e 45 2572

Wabash County—
Harris & Meyers, Denman 1, ne sw sw se 17-1s-12w (pb 2039).. 135 2410
Exchange, Strasser 1, se sw sw 3-2s-13w ..... * 2800
Phillips, Schultz 11, ne sw nw nw 7-3s-13w 124 2525

Washington County—
Ruwaldt, Bender 2, ne nw nw 20-3s-1w 30 1385
W. C. McBride, Frieman 2, nw se nw 29-3s-4w 80 1029

Wayne County—
Pure, Hill 1, e½ nw sw 1-1n-7e..... 282 3053
Garrison Cons. 1, w½ sw se 36-2n-7e 324 3070
Russ Johnson, Richart 1, n½ ne se 12-2n-9e ..... * 3180
Miller & McFarland, Phillips 2, swc se sw 4-2s-7e 96 3303
Johnson Bros., Poorman 2, sw se nw se 19-3s-8e 125 3250

White County—
T. M. Pruett et al, Boultinghouse 1, nw se se ne 17-4s-14w 124 2720
W. W. Gray, Fee 2-A, sw sw ne 17-4s-14w 87 2569
Fee 2-H, ne ne ne 20-4s-14w..... 180 2840
Superior, Fitton 9, se sw nw 23-4s-14w 290 2670
Fitton 1, se se se 28-4s-14w 196 2816
Sun Oil, Greathouse 21, se se se 33-4s-14w 215 2727
Greathouse 22, se sw se 33-4s-14w 125 2737
Phillips Pet., Garr 2, nw se sw 36-4s-10e (pb 2320) 14 3102

Williamson County—
Austin Drg. Co., Neiber 1, Apx. nw se nw 12-10s-1e ..... * 2060

OLD WELLS DEEPENED

Hamilton County—
Hinkle, L&N RR 1, nw ne se ne 34-6s-6e (otd 2980) 160 3075
Kingwood, Morris 5, sw ne se ne 34-5s-6e (otd 2970)..... 219 3058

Summary of Drilling Operations in the United States, Week Ended February 22, 1941

	WELLS COMPLETED								PERMITS FOR NEW WELLS*				
		New Wells Drilled for Oil and Gas											
	Total for Week	Oil Wells	Gas Wells	Failures	Initial Production	‡Miscellaneous	Total 1941	Total this Date 1940	This Week	Total this Month	Total 1941	Total this Date 1940	Year Total 1940
Alabama	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
Arizona	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
Arkansas	4	2	....	2	85	....	22	30	7	13	26	12	153
California	15	14	1	....	9,025	....	166	175	25	88	141	166	1,102
Colorado	.....	....	....	....	.....	....	....	2	....	.....	....	.....	.....
Florida	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
Georgia	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
Illinois	41	32	....	7	5,174	2	432	545	65	225	566	650	4,532
Indiana	10	5	2	3	675	....	69	65	....	.....	....	.....	.....
Kansas	32	20	3	7	40,655	2	281	235	46	136	281	235	2,048
Kentucky	8	3	....	5	284	....	49	41	....	.....	....	.....	.....
Louisiana	33	22	3	7	3,504	1	214	239	26	123	221	187	1,658
Michigan	14	6	....	8	1,742	....	116	222	12	62	124	211	1,093
Mississippi	1	1	....	....	295	....	22	24	....	.....	....	.....	.....
Missouri*	.....	....	....	....	.....	....	....	1	....	.....	....	.....	26
Montana	.....	....	....	....	.....	....	26	25	....	.....	....	.....	.....
Nebraska*	1	....	....	1	.....	....	19	.....	4	10	13	.....	69
New Mexico	5	4	1	....	1,565	....	51	130	8	29	54	125	559
New York	14	8	....	....	44	6	95	173	....	.....	....	.....	.....
North Dakota	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
Ohio	20	6	8	6	151	....	219	155	....	.....	....	.....	.....
Oklahoma	14	11	....	3	3,173	....	280	326	33	136	266	290	1,888
Pennsylvania	48	36	5	4	47	3	289	651	....	.....	....	.....	.....
South Dakota	.....	....	....	....	.....	....	....	1	....	.....	....	.....	.....
Tennessee	.....	....	....	....	.....	....	....	5	....	.....	....	.....	.....
Texas	153	116	3	34	68,197	....	1,271	1,638	189	860	1,207	1,606	11,170
Utah	.....	....	....	....	.....	....	....	.....	....	.....	....	.....	.....
West Virginia	13	1	10	2	15	....	118	114	....	.....	....	79	603†
Wyoming	.....	....	....	....	.....	....	14	28	....	.....	....	.....	1
Total this week	426	287	36	89	134,631	14	3,753	4,825	415	1,682	2,899	3,561	24,902
Total last week	495	324	32	113	141,590	26	3,327	4,265	411	1,267	2,484	3,270	24,902
Total this year	3,753	2,384	352	886	1,179,779	131	....	.....	....	.....	....	.....	.....

* This tabulation includes those states where weekly data are available; figures for Missouri date from August 10, 1940; Nebraska from August 3, 1940.
† For first 9 months of 1940 only. ‡ Includes old wells deepened, water-intake, gas input and salt water disposal wells.

United States Well Completions—*Continued*

Indiana

Gibson County—
Continental, Bozeman Land 24, se sw ne 23-3s-14w 96 2871
Kleiderer 3, sw se nw 26-3s-14w. 384 2799
Harrison County—
Albert Schacklette, McBride 1, sw se se sw 1-6s-3e (pb 635).....¶0.04 705
Jay County—
A. M. Jones, Wright 1, se ne ne ne 25-24n-12e 3 1085
Pet. Dev. Corp., Binegar 1, ne ne nw 29-24n-13e (pb 1840)..... * 3404
Knox County—
C. L. Maguire, Bland 1, se ne se 15-5n-10w ..... * 3055
Newton County—
Vaughan & Smith, Boyle 1, nec nw ne 5-31n-8w ..... * 1125
Posey County—
Gulf Refining, Burrows 1, sw nw sw nw 8-5s-13w ..... * 3086
Harris-Stuart et al, Strueh 2, se se ne 1-7s-12w 72 1732
Basin Dr. Co., Oakland City College 1, ne ne sw 16-3s-14w 120 2579
Spencer County—
Kentucky Nat. Gas, Schamahorn 3, nwc ne nw 29-7s-6w.....¶14.16 905

Kansas

Barber County—
Lario, Nuckols "B" 1, c se se 19-31-11w ..... * 4436
Barton County—
B. B. & M., Esfeld 5, swc se 28-16-11w 3000 3375
Shell, Harzman 1, nec nw 33-16-11w 3000 3356
Phillips, Weber 2, c n½ sw nw 13-16-12w 3000 3335
Wakefield, Miller 1, nec se 17-16-13w 2222 3401
Piggott et al, Beran 1, c e½ ne ne 24-17-12w ..... * 3367
Herndon, Hagan 1, c n½ ne sw 20-20-11w 339 3344
Continental, Schuefler 2, c nw 24-20-12w 1484 3350
Texas, Disque 9, swc 3-17-11w..... * 3372
Elk County—
Mid-Plains, Holmes 1, sw se nw 20-28-11e ..... * 1287
Ellis County—
Dickey, Henderson "C" 1, c w½ nw nw 6-11-17w ..... * 3559
Darby, Peavey "D" 1, c n½ nw nw 19-11-17w 250 3384
Ellsworth County—
Rosespring, Talsky 6, c w½ nw ne 8-16-10w (pb 3317)..... 132 3322
Continental, Janzen 3, cel se sw sw 22-17-8w 3000 3246
Cities Service et al, Wessler 4, sw ne se 19-17-9w 3000 3242
Wakefield, Janssen 1, c e½ se nw 29-17-10w 429 3300
Magnolia, Zink 4, c n½ ne sw 32-17-10w 505 3245
Finney County—
Northern Natural, Brown 1, c sw 20-25-34w (pb 2688).....¶11.0 2729
Greenwood County—
Seaney, James 1, nwc se 17-28-11e. 100 1224
McPherson County—
El Dorado Pipe & Supply, Sellers 1, c sw sw 19-19-1w..... * 3010
Pratt County—
Skelly, Goyen "C" 1, c n½ 8-28-11w .....¶9.25 4238
Rice County—
Continental, Hamilton "A" 3, se nw nw 19-18-7w 2270 3227
Powell 4, sw nw nw 31-18-7w (pb 3213) 150 3241
McPherson, Cannon 1, ne nw se 8-19-9w 3000 3242
Colorado, Keesling "C" 1, c w½ sw se 3-20-9w ..... * 3246
Rooks County—
Broadview, Beardmore 2, c s½ se sw 2-9-16w 2162 3358
Russell County—
Billings, Herbel "B" 2, sw se sw 26-14-14w 2412 3178
Landon et al, Boxberger 5, sw nw se 26-14-14w 1808 3013
Stafford County—
British American, Meyer 2, nw sw ne 28-23-12w 3000 3841
Stevens County—
Northern Nat., Bolds 1, nwc se 26-32-35w (pb 2765).....¶8.3 2775

OLD WELLS DEEPENED

Barton County—
Lario, Bryant 2, ne se se 23-20-11w (otd 3276½) 3000 3286
Stafford County—
Stanolind, Fuller 6, ne nw sw 11-24-11w (otd 3742) 2392 3773

Kentucky

Daviess County—
Petroleum Co., Burns 3..... 200 1695
Hancock County—
C. T. Johnson, Crow 2..... * 699
W. J. Flesher, Zuissenberry 4..... * 350
Henderson County—
O. J. Connell et al, Bennett 2..... 75 1507
Ohio County—
E. E. Brown et al, Lewis 1..... * 702
Union County—
Sun & Ky. Nat. Gas, Neal 1..... * 2660
Webster County—
Powell Bros. et al, Ramsey 1..... * 1411

OLD WELL DEEPENED

McLean County—
Ohio Oil, McManama 9 (otd 1414—pb 1480) 8 1660

South Louisiana

Avoyelles Parish (Eola)—
Amerada, Vernon 1..... 347 8570
Cameron Parish (Grand Lake)—
Superior Co., State 17..... 133 11,386
Evangeline Parish (Ville Platte)—
Gulf, Hirsch 1-B..... 422 10,150
Iberville Parish (Bayou Blue)—
Navarro, Wilbert 2..... 113 1803
LaFourche Parish (Bayou Des Allemands)—
Amerada, Gheens 5..... 95 10,016
LaFourche Parish (Chacahoula)—
Sun, Dibert-Stark-Brown 1-A..... * 1581
LaFourche Parish (Lake Long)—
Fohs State 13..... 175 10,160
LaFourche Parish (Valentine)—
Pan American, Harang 22..... 116 3964
LaFourche Parish (Garden Island)—
Texas, State 50.....194 6366
Plaquemines Parish (Grand Bay)—
Gulf, State QQ 12..... 292 8130
St. Martin Parish (Anse La Butte)—
Stanolind, Bergeron 1-A..... 227 4775
St. Mary Parish (Bateman Lake)—
Texas, SMPSB 2..... ¶ 10,990
Terrebonne Parish (Lake Pelto)—
Texas, State 35..... * 6505

North Louisiana

Caddo Parish (Pine Island)—
A. R. Hancock, Helpman 9, 16-21n-16w ..... * 1042
M. H. Marshall et al, Stiles 1, 20-21n-16w 20 2424
H. E. Flynn, Muslow 7, 26-21n-16w. 15 2269
W. C. Curry, Spell 4, 28-21n-15w.. 25 1587
Bienville Parish (Bisteneau)—
Ark.-La. Gas Co., Shehee 2, 13-16n-10w .....¶56.6 5194
Grant Parish (Urania)—
Fred Stovall et al, Maxwell 1, 9-9n-1e ..... * 1537
La Salle Parish (Olla)—
Arkansas Fuel, Kees C-2, 7-10n-3e. 90 2357
Tremont Lbr. Co. A-11, 3-9n-2e.. 105 2373
Placid Oil Co., La. Cent. Lbr. Co. 73, 2-9n-2e ..... * 2975
La. Cent. Lbr. Co. 81, 30-10n-3e. 90 2429
La. Cent. Lbr. Co. 82, 20-10n-3e.. 150 2395
La Salle Parish (Nebo-Jena)—
H. L. Hunt, Goodpine Lbr. Co. A-11, 10-7n-3e 135 3864
Goodpine Lbr. Co. A-12, 17-7n-3e. 150 3899
Goodpine Lbr. Co. A-13, 9-7n-3e. 150 4229
Red River Parish (Bull Bayou)—
Magnolia Pet. Co., Pugh-Polley 9, 30-12n-11w ..... * 2792
Sabine Parish (Converse)—
J. D. Haynes, Frost Lbr. Co. 3, 17-9n-13w 55 1915
Tensas Parish (Wildcat)—
C. R. Pope & Fred Shield, Panola Co. 1, 34-13n-12e..... * 6511
Union Parish (Monroe)—
N. & W. Corp., Bryan 2, 28-20n-3e.. ¶3.5 2210
Webster Parish (Cotton Valley)—
Hassie Hunt, Childs 1, 20-21n-9w.. 555 8947

OLD WELL DEEPENED

Union Parish (Wildcat)—
Tiki Exploration Co., Jones 1, 30-21n-3w (otd 3550)..... * 3773

Michigan

Allegan County—
Bridger Basin Oil Co., Meredity 1, sw sw se 5-2n-11w ..... * 1126
Arenac County—
C. W. Teater, Rockafellow 3, sw se ne 22-19n-3e 1390 2889
Don Rayburn, Milne 2, se sw se 23-19n-3e 75 2952
Chapman Oil Co., McTaggart 2, nw ne ne 26-19n-3e 40 2992
Clare County—
American Dr. Co., Cornwell 1, c s sw sw 8-18n-3w ..... * 4501
Sun Oil Co., Strange 1, c n nw sw 36-20n-6w 180 3791
Eaton County—
Rex O. & G. Co., Hults 1, sw se sw 20-3n-4w ..... * 2272
Gladwin County—
Bentley Oil Co., Davis 1, c s sw nw 17-17n-2e ..... * 3650
Huron County—
Gordon Walker, Hellums 1, sw ne se 17-17n-14e ..... * 3050
Isabella County—
Lupher Dr. Co., Bowman B1, se se ne 27-16n-3w ..... * 3819
Lenawee County—
N. J. Bertson, Heath 1, se se se 13-6s-5e ..... * 2103
Montcalm County—
Belvidere Oil Co., Hartman 1, sw se se 6-12n-5w ..... * 1338
Ottawa County—
C. A. Welsh, Carlson 1, nw se ne 33-7n-13w 30 1814
H. C. William, Gavin 1, sw ne ne 33-7n-13w 27 1847

Mississippi

Yazoo County (Tinsley Dome)—
Union Prod. & Texas Co., Childress A-2, 24-10n-3w 295 4623

Nebraska

Richardson County—
McNulty & Bass, Cander 1, sw nw sw 15-2n-13e ..... * 2602

New Mexico

Eddy County—
Aston-Fair et al, State 2-C, nw se ne 11-18s-29e 360 2668
F. E. Baker et al, Root 2, c sw nw 12-17s-29e 312 2565
Lea County (Halfway)—
Argo Oil Corp., State-Texaco 3-B, nwc se 16-20s-32e..... 255 2604
Lea County (Maljamar)—
Carper Dr. Co., Simon 3-A, c ne sw 29-17s-32e 638 3964
Torrance County—
Chief O&G Co., Pace 1, 12-6n-7e..¶0.25 2062

New York

Allegany County—
South Bolivar Oil Co., McKelvey farm, Bolivar 4 1365
D. V. McCarthy, Wilson farm, Bolivar 5 1320
Knights Creek Oil Co., Norton farm, Bolivar 4 1069
Bradley Prod. Corp., Fitz-Carrol farm, Bolivar 8 1456
L. H. Thornton et al, Fassett farm, Willing 5 1282
Sloan & Zook, McDermitt farm, Bolivar 5 1391
F. J. Wilson, Burdick farm, Wirt. 5 1377
H. W. Patterson, Fuller farm, Scio 8 878

WATER INTAKE WELLS

Allegany County—
Franchot Oil Co., Murphy farm, Alma 1537
South Bolivar Oil Co., McKelvey farm, Bolivar 1343
Ebenezer Oil Co., Norton farm, Bolivar 1516
Bradley Prod. Corp., Duke farm, Alma 1440
Bradley Bros. Inc., Homestead farm, Bolivar 1350
Shaner Oil Co., Green farm, Genesee 1387

Ohio

Ashland County—
Obrecht et al, Galloway 1.....¶0.08 712
Sloan & Zook, Urban 1..... * 767
Athens County—
Ernest Gibson, Morrison 3..... 5 440
F. H. Gifford, Parmiter 5..... 2 447
Snyder et al, Butcher et al 1..... * 1950
Charleton, Day 1..... * 250
Cook et al, Laughlin 1..... * 760
Speary Co., Smith 8..... * 632
Coshocton County—
Murphy Pet. Co., Ashcraft 2..... 10 3130
Cuyahoga County—
Benedum-Trees, Ruple .....10 & ¶1.0 2902
Meredith 1 .....2 & ¶1.0 2860
Dean 1 .....$0.99 2832
Cushing Bros., Otis Steel 1..... * 2745
Gallia County—
Ohio Fuel, Thomas 1.....¶0.04 1826

United States Well Completions—*Continued*

Company, Well and Location	Init. Prod. Bbls.	Depth
Geauga County—		
East Ohio, Crile 1	*	6106
Jefferson County—		
C. S. Kelly et al, Houseman 5	8	1340
Knox County—		
Upham Gas Co., Loney 1	¶3.0	2820
Max Johnston, Hager 1	¶0.3	2773
Hunter 1	¶0.13	2850
Licking County—		
Ohio Fuel, Crawford 2	¶0.96	2390
Wm. Mauller et al, Foster 1	¶0.45	2307
Hoover Bros., Schisler 1	¶0.2	2380
Rutledge et al, Osborn 1	$0.02	2360
Lorain County—		
Wm. Dempsey, Bunt 2	*	375
Ohio Fuel, Mashinski 1	*	2396
Medina County—		
W. E. Sawyer, Wilbur 3	*	345
Ohio Fuel, Firestone 1	*	2550
Monroe County—		
Herman Hill et al, Dye 1	1	1500
Christy et al, Hagerman 1	¶0.04	1502
Muskingum County—		
Atha, Sherman 3	15	4120
Noble County—		
W. C. Harper, Hayes 2	5	240
Perry County—		
Palm Oil Co., New Perry Coal 2	125	3323
Allegheny Oil Co., Berrisford 29	4	1080
Preston Oil Co., Shaw 1	*	2910
Stark County—		
J. C. Steiner, Waltenbaugh 1	¶0.4	4558
Tuscarawas County—		
East Ohio Gas, Anderegg 1	¶0.74	4288
Van Wert County—		
Marsh Foundation, Fee 1	¶0.05	1225
Washington County—		
Nichels et al, Atkinson 1	1	355
Beardsmore Oil Co., Cline 1	¶0.06	1886
E. A. Metcalf et al, Hendershot 4	*	1380

Oklahoma

Company, Well and Location	Init. Prod. Bbls.	Depth
Caddo County—		
Magnolia, Surbex 10, nw se se 3-5n-9w	319	3340
Carter County—		
W. H. Smith, Ward 4, sw sec 18-4s-2w	432	2161
Creek County—		
Kirchner et al, Carson 1, ne se nw 23-17n-9e	*	3225
Kiowa County—		
Shell, Ratliff 5, ne nw se ne 19-7n-17w	657	1215
Lincoln County—		
Mid-States, Provaznik "A" 5, sw nw sw 33-12n-6e	175	3334
Provaznik "A" 6, se nw sw 33-12n-6e (pb 3332)	80	3337
Okfuskee County—		
Wells, Robinson 2, c ne sw 12-10n-11e	*	1730
Shell, Replogle 6, nw se se 35-11n-8e	417	3444
Phillips, Joney 1, se ne ne 34-12n-8e	268	3674
Pontotoc County—		
Senora, Denver-Burke 2, se sw se 25-5n-4e	70	2616
Pottawatomie County—		
Smith, Lightfoot 2, nec 6-7n-4e	250	3941
Andradee, Decker 2, ne sw sw 16-7n-4e	40	3535
Seminole County—		
Amerada, Karr 1, c n½ se sw 30-9n-6e	465	4267
Woods County—		
Gulf, Hess 1, c ne nw 33-23n-13w	*	8367

East Texas

Company, Well and Location	Init. Prod. Bbls.	Depth
Joiner Area—		
Miller Prod. Co., Bradford 10-A (34-ac)	1500	3586
Roosth & Genecov, Moores 1-A (38/100-ac)	1200	3632
Kilgore Area—		
J. Beren et al, Jones 2-B (6-ac)	120	3688
Delta Dr. Co., S. Dunn 2 (1½-ac)	175	3620
Nioco Oil Co., Knowles 11 (7.16-ac)	500	3585
V. J. Pearson et al, Young 2 (½-ac)	600	3575
Potter Bros. Prod. Co., Griffin 3-A (46/100-ac)	1200	3578
Griffin 9-A (71/100-ac)	160	3580
J. W. Russell et al, Lacy 3-A (267-ac)	960	3468
Shell, Elder 53 (196-ac)	4500	3645
John Wrather et al, Culver 2	600	3563
Longview Area—		
E. L. Ames et al, Lee & Jenkins 1, tr 1	2400	3645
O. C. Bailey & Trimble, Jones 12 (15-ac)	3000	3667
Jones 14 (15-ac)	3600	3685
L. G. & S. Oil Corp., McQueen 10-C (94.54-ac)	450	3629
Anderson County (Wildcat)—		
Texas Co., Greenwood 1	†	2186
Franklin County (Talco)—		
M. Crichton et al, Haydon-Sun 1	856	4315
Talco Asphalt & Ref. Co., Rutherford 4	108	4299
Texas Co., Barker 21	195	4277
Freestone County (Wildcat)—		
C. W. Killough-E. B. Germany, Woolens 1	*	4100
Limestone County (Tehuacana)—		
Zephyr Oil Co., Yelverton 1	*	2653
Navarro County (Richland)—		
C. L. Brown et al, Brown 2	27	2994
Smith County (Wildcat)—		
Wm. Flanagan & W. R. Nicholson, Hale 1	*	5210
Titus County (Talco)—		
Magnolia, Chapman 8	*	4375
Titus County (Talco)—		
W. B. Hinton et al, Blalock 2	288	4332
Van Zandt County (Van)—		
Preston Calvert et al, Carter 2	539	2859
Wood County (Wildcat)—		
Delta Dr. Co.-Sells Pet. Inc., Beckham 1	*	7501

Texas Panhandle

Company, Well and Location	Init. Prod. Bbls.	Depth
Carson County—		
Clayton-Dwyer Dr. Co., Schafer-Texaco 6	360	3093
Magnolia, Fee (Tr. 244) 97	211	3156
Gray County—		
Bradshaw O&G Co., Pope 6	178	3301
Cities Service, Bender 12	65	3300
Magnolia, Fee (Tr. 227) 41	117	3000
Wilcox O&G Co., Coombs-Worley 47	156	3105
Hutchinson County—		
Parton & Holt, Whittenburg 4	109	3075
Phillips Pet. Co., Cockrell 50	245	3060
Skelly Oil, Herring 8-A	¶3.5	2971
Texas Co., Lewis 34	285	2997
Moore County—		
Shamrock O&G Co., Thomas 1 (pb 3482 ft)	¶193	3570
Wheeler County—		
Magnolia, Worley 7	113	2430

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United States Well Completions—*Continued*

West Texas

Cochran County (Duggan-Slaughter)—
Osage Dr. Co., Moore-Honolulu 2-B 665 5073
Moore-Honolulu 1-C 288 5076
Moore-Devonian 2-E 366 5065
Smith-Cascade 2 ..... 497 5076
Crane County (Gulf-Waddell)—
Gulf, Waddell 37.....8784 3505
Henderson 25 ..... 444 3556
Crane County (Jordan)—
Texas Co., University 6-A..... 195 3600
Ector County (Foster)—
Continental Oil Co., Johnson 4-B.. 350 4300
Lee Dr. Co., Johnson 12..... 694 4306
M. B. K. Co., Gist 4-A.....1158 4320
Ector County (Jordan)—
Cities Service, University 8-C..... 296 3610
Gaines County (Seminole)—
Magnolia & Atlantic, H. & J. 6-217 508 5309
H. & J. 11-251..... 885 5295
Gaines County (Wasson)—
Continental & Amon Carter, Langdon 7-44 ..... 745 5040
Hockley County (Duggan-Slaughter)—
Bond Oil Corp.-Awoeb Oil Co., Mid-Seale 3-B 1052 5005
Pecos County (Walker)—
J. D. Lancaster et al, White-Baker 1 ..... 140 2101
Terry County (Duggan-Slaughter)—
Gulf, Mallett 5 .....1662 5040
Winkler County (Hendrick)—
Stanolind & Westbrook-Thompson, Hendrick 4-C-T-89 ..... 102 3020
Yoakum County (Wasson)—
Aloco Oil Co., Walker-Texaco 7.... 579 5263
Continental Oil, Stevens 6-A.....1148 5057
Don Danvers et al, Willard 1-B...1214 5280

West Central Texas

Callahan County—
L. A. Warren - Eastland Oil Co., Ross 1 ..... * 1253
Coleman County (Wildcat)—
McDonald & Campbell, Stafford 2 * 1512
Jones County (Wildcats)—
G. M. Gillespie et al, Young 2..... * 2260
Thos. Humphrey et al, Norwood 1.. * 2950
Jones County—
Danciger O&R, Gale 1..... * 2730
Hedrick Oil Co., Akard 1-D..... 152 2141
F. K. Johnson-Ungren & Frazier, Sayles 4 ..... 165 1952
Sayles 6 ..... 282 1947
Lewis Prod. Co., Sayles 19..... 156 1977
Pet. Producers Co., Bryant-Link 6 260 1886
Sandy Ridge Oil Corp., Alton-Magnolia 5 (new pay)..... 210 2025
Shackelford County (Wildcats)—
L. H. Choate et al, Myrick 1.... * 718
Fortex Oil Corp., McKeever 1-14.. * 3249
Shackelford County—
F. O. Akin et al, Powers 2..... * 1636
Chas. Midkiff et al, Dorsey 1..... * 420
Stephens County—
Wittmer-Knight-Ewing, Compton 1 992 3608

South Texas

CORPUS CHRISTI DISTRICT

Brooks County (Kelsey)—
Magnolia, State-Marshall 2..... 500 4741
Jackson County (Lolita)—
Magnolia, Hamilton 3..... 550 5939
Jackson County (West Ranch)—
Magnolia, West 127-A.....1050 5126
Jackson County (Wildcats)—
Humble, Mauritz Bros. 1-B, blk 10, Benj. J. White sur, 7 mi ne LaWard, new fld.....1100 5942
Wynn Crosby Dr. Co., Gayle 1, 200-ac lse, Clare lge, 4 mi ne LaWard * 6508
Jim Wells County (Ben Bolt)—
Bridwell, Smith 3..... 550 5249
Jim Wells County (Wade City)—
Magnolia, Schmidt 7..... 500 4911
Jim Wells County (Wildcat)—
Henshaw Bros., Grossman 1-B, 80-ac lse, Casa Blanca gr..... * 5900
Johnson, Nelson & Cosner, Singer 1, 1134.8-ac tr ..... * 5500
Nueces County (S. Clara Driscoll)—
Texas Conservative, Flinn 3-B..... 350 5710
Nueces County (Shield)—
Stanolind, Baldwin 1..... 450 6624
Nueces County (Stratton)—
Gulf Plains, Jones 1.....¶ 50.0 & 300 6555
Refugio County (McFaddin)—
Barnsdall, Marberry 5..... 450 5665
Refugio County (Tomoconnor)—
Quintana, Williams 25-A..... 525 5922
Victoria County (N. Keeran)—
Barnsdall, Keeran 10..... * 7515
Victoria County (Wildcat—Terrell)—
Sunray, Terrell 1, cntr 125-ac tr, John B. Sideck sur, ½ mi nw disc * 5271
Nueces County (Agua Dulce)—
Union Prod., Walton 1.....¶80.0 5001

LAREDO DISTRICT

Duval County (Bridwell)—
Bridwell, Parr 4..... 500 4314
Duval County (Casa Blanca)—
Bajeos Co., Martin 1..... * 1221
Duval County (Cedro Hill)—
Magnolia, Duval Co. Rch. Co. 22 (132) 35 1511
Duval Co. Rch. Co. 26 (189)..... * 2107
Duval County (Charamousca)—
Magnolia, Duval Co. Rch. Co. 12 (289-290) 60 1590
Duval County (Wildcats)—
Continental, Driscoll 5-B, 3920-ac lse, 9400-ft s 1-B, Palo Blanquito gr ..... * 4521
Giblin & Tsesmelis, Holzapfel 1, sur 178, 1280-ac tr, 18 mi nw Freer, new fld..... 50 1203
Jim Hogg County (Colorado)—
K. D. Harrison, Trevino 5-A..... 350 3046
Humble, Atwood 26..... 200 3112
King Ranch-Colorado 19-B..... 275 2994
King Ranch-Colorado 15-B..... 350 3046
Jim Hogg County (Kelsey)—
Humble, Pena 4..... 350 4744
Jim Hogg County (Manila)—
Appell & Robertson, Allen 1..... * 2604
Jim Hogg County (Wildcat—Holbein)—
M. L. Massingill, McLean 2, sec 3, cntr blk 19..... 77 2810
Starr County (Wildcats)—
Sun, Trevino 1, blk 2, McBride subd, Santa Teresa gr, 1 mi s Kelsey fld ..... * 4836
J. O. Williams et al, Garcia 1, 80-ac lse, 200 ac tr, 1 mi w Boyle fld.. * 100
Webb County (Killam)—
O. W. Killam, Garcia & Villarreal 4. 60 2030
Webb County (Wildcats)—
Adams & Lefevre, Billings 1, CCSD &RGNG sur 13, on 160-ac lse, 2½ mi w Lopez fld..... * 1893
Sam Cunningham, Dannelly 1, sec 736, 40-ac lse, 3 mi w Bruni..... * 2611
W. H. Holland, Bruni 1, sw¼, sur 446, 7 mi sw Bruni..... * 3007
Zapata County (Wildcat)—
Dulup, Haynes 2, sec 18, Haynes subd, 1120-ac lse, 15 mi s Escobas * 1203

SAN ANTONIO DISTRICT

Guadalupe County (Wildcat)—
C. G. Hamill et al, Boeck 1, 91.7-ac John Christopher sur, 4½ mi ne Lavernia ..... † 2540
Medina County (Chicon Lake)—
Valdemar T. Fearis, Medina Irr. Farms 1, temp abnd..... * 860

North Texas

Archer County (Hull-Silk Deep)—
Blackwell & Helmerich-Payne, Wilson 11 ..... 818 4629
Archer County—
Guy J. Brown et al, Hughes 1..... * 2000
Deep Oil Dev. Co.-R. G. Dr. Co., Little 10 ..... 24 1370
Clay County (Wildcat)—
Akin-Dimock-Costley, Patrick 1... 20 1112
Clay County—
Duncan & Arnhold, Duncan 20.... 65 1207
Johnson & Kouri, Taylor 3..... * 1338
Cooke County—
Bridwell Oil Co., Trew 8..... 7 1178
C. & L. Oil Co., Perkins 22..... 10 815
Jas. C. Roberts et al, Sicking 1.... 240 1300
Whitfield-Pearson & Grimes, Sicking 8 ..... 288 1269
Cooke County (Walnut Bend)—
Sinclair Prairie, Cox 1-A..... 129 4991
Ramsey 5 ..... 363 5011
Jack County—
Paul Steed et al, Derrick 2..... 710 3109
Joe Worsham et al, Leach 2.....1000 2895
Montague County (Nocona-Rogers)—
Stanolind, Miller 1..... 664 5350
Montague County—
Claymont Oil Co., Bouldin-Crow 7 27 819
Tarrant County (Wildcat)—
Bruce Sullivan-Hill et al, Putman 1 * 7836
Wichita County (K-M-A Ellenberger)—
Shell & Phillips Pet. Co., Griffin 20 688 4400
Wichita County (K-M-A)—
Bishop Oil Co., Waggoner Bros. 5-A 664 3781
R. P. Dorian et al, Ancell 1, sec 36 * 4077
Mid-Union Dr. Co., Fassett-Tuttle 4 202 4068
Fassett-Tuttle 5 ..... 496 4069
Mul-Berry Oil Co., Bradley 8..... 440 3810
Shell & Phillips Pet. Co., Griffin 19.1168 3846
Wichita County—
Akin-Dimock et al, Waits 1..... 38 1330
Perry Browning et al, Warren 1 (pb 1766 ft)..... 10 4001
Coppock & Coleman, Warren 2.... 9 1506
Mogren & Anderson, Mertens 16.. * 945
Underwood Oil Co., Rogers 12... * 1230
Wilbarger County (Consolidated)—
J. A. Woods et al, Womack 4.... † 2580
Young County (Wildcats)—
Echols & Fentress, Baker 1..... * 530
H. N. Tucker et al, Howard 1..... * 803
Young County—
Burma Pet. Co., Dunagan 1..... 22 917
L. T. Burns et al, Bloodworth 7.. 75 787
Kimmell, Lee & Co., Campbell 3-A * 978
Campbell 1-C 2 975
Chas. B. King et al, Brown 3..... 4 580
P. B. Worthington et al, Clark 4.. 52 888
Clark 5 ..... * 906

Texas Gulf Coast

Brazoria County (West Columbia)—
Gulf, Mays 8..... 302 5737
Hogg, Hogg 3-A..... 575 4606
Fort Bend County (Thompsons)—
Naylor, Booth 11-B..... 155 7811
Harris County (Fairbanks)—
Amerada, Foley 31..... 170 8258
Stanolind, Jahnke 13..... 140 6850
Jefferson County (Fannett)—
Gulf, Bordages 8..... 779 8382
Matagorda County (North Markham)—
Ohio, Carlson 4..... 254 7980
Orange County (Port Neches)—
Texas, Polk B-9..... 129 5751
Polk County (Segno)—
Humble, Kirby 33-B..... 386 8196
Wharton County (Withers)—
Texas, Pierce B-69..... 121 5380

Pennsylvania

BRADFORD DISTRICT

Messer Oil Corp., Loop..... 2 ....
C. M. Lippert et al, Lippert..... 6 ....
Grant & Mohan Oil Co. 486-7, Bing 3 ..... 2 ....
Pine Run Oil Co., Bing 130-1-2-3-4-6 3 ....
Bradford Tr. Co., 21 wells..... 21 ....
Forest Oil Corp..... 1 ....
Forest Pet. Corp., 2 wells..... 2 ....
Niagara Oil Corp., 4 wells..... 4 ....

NEW YORK-PENN GAS FIELD

Lawrence Gas Co., Bentley..... ¶ ....
Updegraff, Barcus ..... ¶ ....

MIDDLE DISTRICT

David B. McCalmont, Davies..... 2 ....
H. L. Helschel, Fee..... 1 ....
Oil City Trust Co., Thompson..... 1 ....
G. N. and E. J. Elder, Elder..... * ....
Titusville Tr. Co. and Fleming, Lot 3192 ..... * ....

BUTLER-ARMSTRONG DISTRICT

Charles Hildebrand, Shroup Hrs... 2 ....

SOUTHWEST DISTRICT

Allegheny County—
Potts Bros., Mawhinney 1.....¶0.16 2700
Armstrong County—
Apollo Gas Co., King 1.....¶0.08 3412
R. C. Galbraith et al, Alcorn 1....¶0.02 3230
Fayette County—
Duquesne Gas Co., Collins 1.....¶0.17 2641
Green County—
Romney Rutan et al, Clutter 2.... * 3418
Indiana County—
T. W. Phillips, Ramsey 1..... * 3655
Washington County—
Carnegie Nat. Gas, Gilkerson 1....¶1.07 1635
J. D. Amos et al, Myers 1.....¶0.03 3229
Foley & Williams, Vankirk 2..... * 1793

WATER INTAKE WELLS

Bradford District—
Messer Oil Corp., Loop..... .. ....
Forest Pet. Corp., 2 wells..... .. ....

West Virginia

Boone County—
Owens-Libby-Owens, Cassingham Coal Land 33.....¶0.11 2114
Braxton County—
Robinson & Weaver, Morrison 1... ¶0.5 2173
Cabel County—
W. Va. Gas, Hay 1.....¶0.18 3220
Doddridge County—
R. J. Braden Co., Swiger 9....¶0.15 & 8 2127
Gilmer County—
D. H. Bland, Coberly 1.....¶0.25 2125
McCall Dr. Co., Arbuckle 2..... * 1880
Harrison County—
Eagle Gas Co., Lyons 1.....¶0.15 2877
Kanawha County—
United Fuel Gas, Legg 4893.....¶0.05 4835
Lincoln County—
Harmon Gas Co., Adkins 1.....¶0.15 3710
Roy & McComas, Cummings 1.....¶0.13 3344
Mingo County—
McKinley Trent, Tr., Stepp 4.....¶0.75 2046
Monongalia County—
Roy W. Clovis, Lamley 1.....¶0.13 1267
Pleasants County—
St. Marts First Nat. Bank, Jones 2.¶0.03 1950
Putnam County—
Buff Creek Gas Co., Pullens 1..... ¶6.0 1592
Ritchie County—
Cronin & Goodwin, Goff 1..... ¶1.0 1890
Lemon, Mullennax 1..... 15 1970
G. L. Ballantine, Libbs 1..... ¶0.7 1840
Roane County—
W. B. Hughes, Westfall 2..... * 1705
Tayler County—
Pitts. & W. Va. Gas, Brightwell 6119 ..... ¶ 2505
Upshur County—
Cumberland & Allegheny Gas, Harris 302 .....¶0.65 2051
Winemiller 299 ..... * 4345
Wayne County—
R. J. Petry, Thompson Mfg. 1....¶0.18 2600
Gas Corp., Nease 1.....¶0.09 3141
Owens-Libby-Owens, Wilson Coal 27 ..... * 3825
Wetzel County—
Null & Morehead, Fee 5.....¶0.06 3200

WILDCAT REPORT
New Starts and Completions

ARKANSAS
COMPLETION

Woodruff County—Tatum & Watkins' Miller 1, nw ne 7-5n-2w, abnd 1770 ft.

CALIFORNIA
FIRST REPORTS

Kern County—Bankline Oil Co.'s No. 24-24, sec 24-11-23, lcn, Maricopa area.

Los Angeles County—Fred S. Jasper's No. 1, sec 17-4-17, lcn. Morse-Mangold, Inc.'s Laughlin 1, sec 26-5-17, lcn, Castaic area. Texas Co.'s No. 1, sec 14-3-16, lcn, Newhall area.

KANSAS
FIRST REPORTS

Barton County—Stearns & Vernon O. & G. Co.'s Popp 1, ne se nw 15-16-14w, rig.

Cowley County—Trees Oil Co.'s Johnston 1, nw sw se 13-31-4e, cellar.

Douglas County—Meinholdt et al's Stanley 1, nw ne nw 3-14-21e, sd 1135 ft.

Greenwood County—C. H. Reeser et al's Knight 1, sec sw 31-27-11e, lcn.

McPherson County—Engle et al's Carlson 1, sw se se 8-20-5w, rig.

COMPLETIONS

Ellis County—Stearns Dr. Co. et al's Witt 1, c s½ ne sw 28-12-16w, N. Emmeran pool disc, Lansing 3342 ft, base Kansas City 3545 ft, Arbuckle 3609 ft, td 3626 ft, pb 3527 ft, packer 3482 ft, 8000 gals acid, 647 bbls 36.4-gr oil, 25 percent water.

Rice County—Hinkle Oil Co.'s Kitchen 1, c w½ nw ne 11-18-9w, 2 mi se Lorraine pool, Anhydrite 430 ft, Ft. Riley 1400 ft, Florence 1530 ft, Wreford 1605 ft, Cottonwood 1755 ft, Neva 1790 ft, Topeka 2498 ft, Lansing 2883 ft, Sooy 3252 ft, no show, Arbuckle 3303 ft, abnd 3324 ft. Bradley Oil Co.'s Roelf 1, c n½ nw nw 24-18-10w, 2 mi ne Orth pool, Topeka 2528 ft, Lansing 2947 ft, Sooy 3270 ft, Arbuckle 3294 ft, abnd 3303 ft. Bunting-Dowling & Skow et al's Mants 1, c w½ sw ne 17-19-10w, 2 mi n Silica pool, Topeka 2610 ft, Lansing 2983 ft, Sooy 3308 ft, Arbuckle 3323 ft, 300 gals acid, abnd 3365 ft. A. D. Cochran et al's Miller 1, c n½ nw nw 31-20-9w, 2½ mi s Chase pool, Topeka 2730 ft, Lansing 2970 ft, Sooy 3254 ft, Simpson 3300 ft, sso 3311 ft, Arbuckle 3343½ ft, abnd 3375 ft.

NORTH LOUISIANA
COMPLETION

Tensas Parish—C. R. Pope and Fred Shields' Panola Co. 1, sw se 34-13n-12e, abnd 5511 ft.

MICHIGAN
FIRST REPORTS

Allegan County—C. C. Berlin's Wagner 1, sw sw ne 16-4n-12w, dr.

Gratiot County—C. M. Carother's Hawes 1, c n nw ne 17-11n-4w, lcn.

Macomb County—L. C. Johnson's Pohly 1, ne se se 22-4n-14e, lcn.

Saginaw County—Robert Bond's Doehring 1, c e ne nw 11-12n-1e, dr.

COMPLETIONS

Allegan County—Bridger Basin Oil Corp.'s Meredith 1, sw sw se 5-2n-11w, abnd 1126 ft.

Clare County—American Dr. Co.'s Cornwell Ranch 1, c s sw sw 8-18n-3w, Dundee 4086 ft, abnd 4501 ft.

Eaton County—Rex O. & G. Co.'s Hults 1, sw se sw 20-3n-4w, abnd 2270 ft.

Huron County—Gordon Walker's Hellums 1, sw ne se 17-18n-13e, Traverse 1590 ft, Dundee 2093 ft, Monroe 2615 ft, abnd 3050 ft.

NEBRASKA
FIRST REPORTS

Harlan County—Veeder Supply Co. et al's Battin 1, c s½ se nw 15-2n-18w, sd 150 ft.

Jefferson County—S. F. Miller et al's Bethoud 1, c w½ sw sw 2-4n-6e, dr.

COMPLETION

Richardson County—McNulty & Bass et al's Cancer 1, sw nw sw 15-2n-13e, 25 mi nw Falls City pool, base Kansas City 1197 ft, Hunton 1789 ft, Maquoketa shale 2040 ft, Viola 2454 ft, td 2602 ft, perf Hunton, no show, 500 gals acid & 300 gals butane, abnd 2602 ft.

OKLAHOMA
FIRST REPORTS

Seminole County—Blackwell O. & G. Co.'s Boren 1, sw se sw 34-6n-6e, lcn.

Tillman County—Staley et al's Staley 1, swc nw 10-2s-19w, lcn.

COMPLETIONS

Grady County—Tom Palmer et al's Ramsey 1-A, sec ne 31-5n-8w, 2 mi s Cement pool and 3½ mi west Chickasha gas fld, sandy shale 2750 ft, no show, abnd 6446 ft in Pennsylvanian sd.

Muskogee County—H. P. Curtis et al's Burford 1, nec 21-14n-19e, 2 mi s Jolly-Patton pool, sand 570-78 ft, td 578 ft, 150,000 ft gas, rock pres 100 lbs.

Noble County—Portable et al's Conway 1-A, nec 16-23n-2w, ½-mi ne Billings pool, Layton 3573 ft, Checkerboard 3950 ft, Oswego 4075 ft, lime 4365-85 ft, dolomite 4375-85 ft, good so, stain 4370-90 ft, Mississippi 4550 ft, Woodford 3763 ft, Viola 4795 ft, Densmore 4805 ft, Wilcox 4849 ft, abnd 4899½ ft in hard white dolomitic sand.

Okfuskee County—Vierson et al's Leonard 1, sw se nw 11-13n-7e, 4 mi w Micawber pool, Hogshooter 1250 ft, Oswego 2597 ft, sso, Prue sand 2614-45 ft, good so, Inola 3181 ft, Brown lime 3360 ft, Booch 3450 ft, dry, Dutcher zone 3548 ft, dry, Mississippi Caney 3588 ft, so, td 3590 ft, pb 2619 ft, shot 60 qts 2606-19 ft, flow 8 bbls oil 35 bbls water through tubing.

Seminole County—W. A. Delaney, Jr., & Atlantic Ref. Co.'s Clark 1, nec se 30-8n-7e, North Little River pool disc, Calvin sd 2158-70 ft, so, Dolomite 4229 ft, td 4289 ft, pay 4283-89 ft, 7-in csg 4282 ft, 188 bbls, ⅝-in ch on 2½-in tubing, no water.

SOUTH TEXAS
FIRST REPORTS

Calhoun County—Gulfboard Oil Corp.'s Texas 1 (114), tr 114, San Antonio Bay, 10 mi sw Seadrift, 7000-ft test, elev 16 ft, lcn. Gulfboard Oil Corp.'s Texas 1 (117), tr 117, San Antonio Bay, on 640-ac lse, 10 mi e Seadrift on small reef, 7000-ft test, elev 2 ft, lcn.

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Moore & Ahern's Moore & Innis 1, e 78 ac, 178-ac tr, Miguel Castillo sur, 1½ mi n Seadrift, 7000-ft test, lcn.

Dimmitt County—Diamond Half's Kirk et al, 200-ac lse, J. S. Pearce sur 652, ab 1444, 2250 ft se Producers 1, 5 mi nw Carrizo Springs, 2400-ft test, Joe Hartmangruber, cont. mir.

Duval County—J. B. Blanchard et al's Parr 1, sur 134, 640-ac tr, 11 mi nw San Diego, 4350-ft test, elev 532 ft, lcn. H. J. Mosser's Hoffman 1, BS&F sur 121, 1 mi s Tarancahua fld, Shell farmout, lcn. George Proctor et al's Frederick 1, sw¼, sur 344, 2 mi e Adami fld, 1250-ft test, lcn. E. R. Thomas Est.'s de Barrera 1, blk 18, Thos. Lockhart subd, Parr lands, J. Adams sur 11, 1 mi e Muralia fld, 4800-ft test, lcn.

Jim Hogg County—Sal Vieja's Gutierrez 1, lot 45, sur 578, El Peyote gr, farmout from Don Marsh et al, 1½ mi ne Patel fld, 3200-ft test, lcn. Texas Gulf's Bute et al 2, 1¼ mi w 1, 3700-ft test, co rig, tentative lcn.

Karnes County—H. J. Baker's Yanta 1, 706-ac lse, S. G. Hardaway sur, 3½ mi e Helena, 2600-ft test, elev 275 ft, lcn.

Starr County—Sun's Trevino 1-B, 56.58-ac "B" lse, sh 2, Santa Teresa gr, ½ mi w sw 1 dry hole, 4775-ft test, elev 252.2 ft, co rig, ru.

Zapata County—Brogan et al, Montemayor 1, lot 3, sur 63, e ne¼, nw¼ of ne¼ of sur, on 10-ac lse, 2 mi sw Escobas fld, wor.

COMPLETIONS

Duval County—Continental's Driscoll 5-B, 3920-ac lse, Palo Blanquito gr, 9400 ft s 1-B, abnd 4521 ft. Giblin & Tsesmelis, Holzapfel 1, sur 178, 1280-ac tr, 18 mi nw Freer, pump estimated 50 bbls, no definite gauge, td 1203 ft, Munson 1187 ft.

Jackson County—Wynn Crosby Dr. Co.'s Gayle 1, 200-ac lse, 818.5-ac tr, Clare lge, 4 mi ne LaWard, abnd 6508 ft. Humble's Mauritz Bros. 1-B, blk 10, Benj. J. White sur, 542.18-ac lse, 7 mi ne LaWard, 526 bbls, td 5231 ft, ¼-in ch, 650 lbs equalized pressure, 24.4-gr, 2 percent water, 486/1 gas/oil ratio, new fld.

Jim Hogg County—M. L. Massingill's McLean 2, sec 3, Holbein subd, sh 3, Las Animas gr in cntr blk 19, on 140-ac lse, pump est 75 bbls, td 2810 ft, extends Holbein fld ¼-mi n.

Jim Wells County—Henshaw Bros., Grossman 1-B, 80-ac lse, 213.4-ac tr, blks 2 & 3 Dibrell, Sawyer & Gallagher subd, 330 ft nw Nueces County line, abnd 5900 ft, Johnson, Nelson & Cosner's Singer 1, 1134.8-ac tr, Los Presnos de Abajo gr, 1 mi ne Al Smith, abnd 5500 ft.

Starr County—Sun's Trevino 1, blk 2, W. C. McBride, Inc. subd, 144.31-ac lse, 1 mi s Kelsey fld, abnd 4836 ft. J. O. Williams et al's Garcia 1, n 80-ac of 200-ac tr, 1 mi w Boyle fld, abnd 100 ft.

Victoria County—Sunray's Terrell 1, cntr 125-ac tr, John B. Sidek sur, abt ½-mi nw Colton & Colton's Terrell 1, disc well, abnd 5271 ft.

Webb County—Adams & Lefevre's Billings 1, ne¼ se¼, CCSD&RGNG sur 13, 160-ac lse, 2½ mi w Lopez fld, abnd 1893 ft. Sam Cunningham's Dannelly 1, ne¼ sec 736, 40-ac lse, 3 mi w Bruni, abnd 2611 ft. W. H. Holland's Bruni 1, sw¼, sur 446, 7 mi sw Bruni, abnd 3007 ft.

Zapata County—Dulup's Haynes 2, sec 18, Haynes subd, Villa gr, 1120-ac lse, 15 mi s Escobas, abnd 1203 ft.

EAST TEXAS

FIRST REPORTS

Anderson County—Texas Co.'s Greenwood 1-A, 1000 ft w of 2186-ft jkd hole, rur.

Robertson County—H. A. Clary et al's Scott 1, west line 32-ac tr, H. F. Thornton sur, 2 mi w Franklin, mim.

Wood County—Ryan Cons. Pet. Corp.-W. C. McGlothlin's Gaut 1, Wm. Clark sur, 2 mi ne Crow, sp.

Marion County—Henry King et al's Bailey 1 (14-ac), Robt. Maxwell & H. N. Allen surs, mat. Cross Roads Oil Co.'s Orr 1, mat.

COMPLETIONS

Anderson County—Texas Co.'s Greenwood 1, se part 377-ac tr, M. Salisar sur, Keechi Dome, elev 338 ft, jkd 2186 ft.

Freestone County—C. W. Killough & Gene Germany's Woolens 1, e cor 121-ac tr, J. Ryan sur, elev 396 ft, Pecan chalk 2401-2575 ft, Austin chalk 3301-3711 ft, abnd in Woodbine water sand 4083-4100 ft.

Wood County—Delta Dr. Co.-Sells Pet., Inc.'s Beckham 1, sw part 38½-ac lse, G. W. Cowan sur, 3¾ mi ne Mineola, near Haynesville salt plug, elev 356-ft, Pecan chalk 5065 ft, Austin chalk 6620-6840 ft, abnd in Woodbine water sand 7501 ft.

Smith County—M. T. Flanagan & W. R. Nicholson's Hale 1, SEc lse, Isaac Brock sur, 5 mi sw Hawkins, elev 330 ft, Pecan chalk 3220-3430 ft, Austin chalk 4616-4720 ft, abnd in Woodbine water sand 5046-5210 ft.

WEST TEXAS

FIRST REPORT

Borden County—M. L. Richards et al's Drum 1, swc ne H&TC sec 307, blk 97, lcn.

WEST CENTRAL TEXAS

FIRST REPORTS

McCulloch County—I. E. Clark et al's Lively 1, sec of H. F. Hetzfeldt sur 931, sp & sd.

Shackelford County—E. M. DeLoach et al's Cook 1, c se ne E. T. Ry. sec 64, lcn. N. Grossenbacker & C. Hagerty's Elliott 1, swc Lunatic Asylum Lands sec 12, sp.

COMPLETIONS

Coleman County—McDonald & Campbell's Stafford 2, B. Alderata sur No. 275, Caddo 1440 ft, abnd 1512 ft.

Jones County—G. M. Gillespie et al's Young 2, near c ne Orphan Asylum Lands sec 53, abnd 2260 ft. Thos. Humphrey et al's Norwood 1, nwc 182.7-ac tr, J. W. McKissick sur 204, abnd 2950 ft.

Shackelford County—L. H. Choate et al's Myrick 1, se nw B. O. A. sec 47, abnd 718 ft. Fortex Oil Corp.'s McKeever 1-14, near c ne nw H&TC sec 14, blk 3, top Palo Pinto lime 3238 ft, abnd 3249 ft.

NORTH TEXAS

FIRST REPORTS

Jack County—Adam Grafe et al's Bloodworth 1, Wm. McDonald sur, A-470, lcn 3500-ft test. C. H. Peterson et al's Hoefle 1, most s/se cor J. W. Barrett sur A-48, sp.

Young County—L. T. Burns et al's Bailey 1, SEc w½ TE&L sec 60, sp.

COMPLETIONS

Clay County—Akin-Dimock & Costley's Patrick 1, blk 82, Byers subd, new pool, sand 1101-1120 ft, pump 20 bbls.

Tarrant County—Bruce Sullivan-Hill et al's Putman 1, nw part 200-ac lse, M. Gilbert sur, 2 mi ne Saginaw, Trinity series 1059-80 ft, Barnett shale 7138 ft, Viola (upper Ordovician) 7463 ft, Simpson 7563 ft, Ellenberger 7695 ft, abnd 7836 ft.

Young County—Echols & Fentress' Baker 1, SEc R. Richardson sur, sec 1, abnd 530 ft. H. N. Tucker et al's Howard 1, SEc TE&L sec 1366, abnd 803 ft.

Revise K-M-A Ellenberger Field Rules

New rules have been issued by the Texas Railroad Commission governing operation of wells producing from the Ellenberger in the K-M-A field, Archer and Wichita counties, calling for one well on each 20-acre unit, on the basis of 10-acre spacing. Wells may be located 330 feet from lease lines and 660 feet apart.

Wells must be at least 933 feet apart if they are to receive the full 20-acre unit allowance. They may be assigned 40 acres if they are at least 1320 feet apart; and on such wells, as much as 50 acres may be assigned to the final well on a lease. Proration is on acreage and per-well, with 50 percent allocated on each factor.

The commission has required 100 feet of surface casing cemented to the surface, and an oil string cemented 800 feet above the shoe.

Order Ten-Acre Spacing For Six Texas Fields

Orders issued by the Texas Railroad Commission last week provide for standard 10-acre spacing in the following fields in Bastrop and Caldwell counties:

Bateman and Riddle in Bastrop County; Dale, West Dale and South Dale in Caldwell County; and Bee Creek field, in both counties.

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MEN IN THE INDUSTRY'S NEWS

ERNEST W. HORST has been appointed manager of purchases and materials for Oil Well Supply Company. With headquarters at the company's general office in Dallas, he will supervise the purchasing, materials, pricing and traffic departments. Horst joined the company in 1919 at a manufacturing plant then operated in Pittsburgh. Subsequently, he was associated with the purchasing and accounting departments and spent five years as field auditor. In 1934, he was made assistant manager of pricing, and for the last two years has been assistant to the vice president, Midwest Division.

JOHN F. VAN NORT has been named Western division sales manager for Duff-Norton Manufacturing Company, Pittsburgh, with headquarters in the Peoples Gas Building, Chicago. He had been associated with a subsidiary of United States Steel Corporation for 17 years, and goes to Chicago from Duff-Norton Manufacturing Company's plant at Pittsburgh, where duties in various departments familiarized him with mechanical details of the company's line. His office will be with Alex S. Anderson, district manager.

JACK CLEMENS, factory representative at Corpus Christi for Martin-Decker Corporation, Long Beach, California, has added Houston to his territory, while Dave Waters, formerly working out of Houston, will cover North Texas, Oklahoma, Kansas and Illinois.

R. G. HOLLAND, former Ponca City division geologist for The Carter Oil Company, has joined Phillips Petroleum Company, Bartlesville. His transfer is a result of recent exchange of oil properties between the two firms.

WALLACE E. CORWIN, vice president of the Colombian Petroleum Company, has returned to his New York office after a visit to Colombia.

WILLIAM M. SHULZ, Michigan district geologist and chief scout for the Cities Service Oil Company, Mt. Pleasant, has been elected president of the Michigan Oil Scouts Association. With the company's geological division for the past 11 years, Shulz was transferred to Michigan in 1938 from Tyler, Texas. He succeeds Glen Sleight, Michigan resident geologist and chief scout for Sun Oil Company, Mt. Pleasant, president for the past two years.

Eddie F. Pequgnoit, Gulf Refining Company, Saginaw, was elected vice president, a newly created office in the association, and Dean C. Shackelford, The Pure Oil Company, Saginaw, was re-elected secretary-treasurer.

FRED R. SCHROEDER, Shreveport, has has been promoted to superintendent of the geological department of Union Producing Company. He is a graduate of the University of Illinois, and has been with this company since 1930, having previously been stationed in Houston and East Texas.

W. F. WILLIAMS has joined Manning, Maxwell & Moore, Inc., Bridgeport, Connecticut, and will work with accounts in the oil industry. He will make his headquarters in Chicago.

WILLIAM G. THEISINGER, since 1935 welding and metallurgical engineer for Lukens Steel Company, Coatesville, Pennsylvania, has been appointed director of welding research for the company. Born in Carlisle, Pennsylvania, he attended public schools in Harrisburg, Pennsylvania, and joined Harrisburg Steel Corporation. In 1925, he became associated with the New York Board of Transportation in development of welding inspection. In 1930, Theisinger entered Harvard University from which he graduated in 1934 with the degree of Bachelor of Science. During the summer of 1934, he served Western Pipe and Steel Company of California as consulting engineer on high-amperage automatic welding. In 1935, on completing post-graduate work at Harvard University, he received a doctor of science degree.

HARRY A. BURDORF and Frank P. Rhame, vice presidents of Lunkenheimer Company, Cincinnati, have been elected to the company's directorate. Burdorf, who has been with the company since 1905, is in charge of sales, and Rhame, who has been with the company since 1919, is in charge of sales engineering.

HUBERT BALE, Oklahoma City consulting geologist, will discuss "Valuation of Oil Properties" before the Ardmore Geological Society March 5. The meeting, to be held in the Ardmore Hotel, will start at 7 p.m.

CARL E. REISTLE, JR. addressed the University of Texas Student Section of the American Institute of Mining & Metallurgical Engineers recently on "Recent Developments in Drilling and Production Practice."

JOHN LOVEJOY, president of the Seaboard Oil Company, New York, is in Los Angeles, looking over the company's operations in that area.

LLOYD E. TRACY, manager of sub-surface sales for the Midwest Division of Oil Well Supply Company since 1939, has been appointed sales manager of that division. He will continue to make his headquarters at Dallas. Prior to joining the company as sucker-rod sales engineer in 1935, Tracy spent eight years in metallurgical work with National Tube Company.

JAMES ANDERSON made the "20-Years-Ago" column of a Houston paper last week with announcement of his election as vice president and director of Humble Oil & Refining Company, a position he still holds. The item recalled that he had been a former president of Humble Pipe Line Company, and that in his then new position he succeeded W. S. Smullens, who had gone to South America.

JAMES A. DONAN, 44, advertising and sales promotion manager for Standard Oil Company of New Jersey, died February 4 following a heart attack as he was leaving his office in New York. He will be remembered by many people in the production branch of the oil industry in the Southwest as one of the associate editors of Holland Reaves' "Oil Trade Journal" in 1919 and 1920.

W. G. ROGERS, co-discoverer of Rogers & Rogers pool, North Texas, is president of Burma Petroleum Company, recently organized under a Nevada charter with headquarters at Oklahoma City. G. O. Oliver and W. S. Anderson are secretary and treasurer, respectively. The company has started a shallow test in Young County, Texas.

L. O. KELSEY, Republic Natural Gas Company, and Phil Martyn and Charles Sample, both with Houston Oil Company of Texas, discussed the East White Point and the Old White Point fields of San Patricio and Nueces counties at the South Texas Geological Society's meeting in Corpus Christi last week.

F. E. RICE, vice president in charge of the gas and gasoline divisions of Phillips Petroleum Company, Bartlesville, has been named chairman of the 1941 Central Committee on Measuring, Sampling and Testing Natural Gas and Natural Gasoline of the American Petroleum Institute's Division of Production. He entered the industry in 1917 as consulting engineer for Frank P. Peterson Company, later joining Phillips Petroleum Company as chief engineer. He later was superintendent of the

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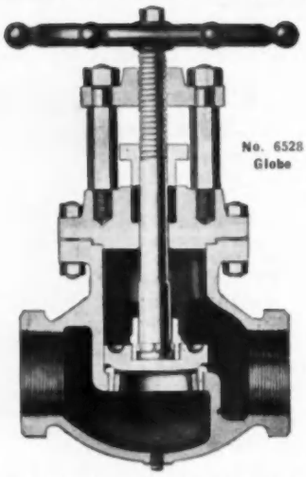

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MEN IN THE INDUSTRY'S NEWS

gasoline division, vice president in charge of refineries and gasoline division, vice president in charge of gas and gasoline divisions, and in 1938 was named to the directorate.

Members of the committee are George P. Bunn, Phillips Petroleum Company, vice chairman; C. A. Young, secretary, and M. J. Adams, The Texas Company, Fort Worth; W. W. Baker, Sinclair Prairie Oil Company, Tulsa; B. R. Carney, Shell Oil Company, Tulsa; J. J. Conry, The Carter Oil Company, Tulsa; J. B. Garner, Hope Natural Gas Company, Pittsburgh; R. D. Gibbs, Union Oil Company of California, Los Angeles; R. Greenslade, Gulf Oil Corporation, Tulsa; R. D. Hanley, Magnolia Petroleum Company, Dallas; R. H. Hargrove, United Gas Public Service Company, Houston; M. W. Kibre, General Petroleum Corporation of California, Los Angeles, and Alois Kremser, Standard Oil Company of California, San Francisco.

Also, E. R. Lederer, Bradford Refining Company, Bradford, Pennsylvania; W. F. Lowe, Natural Gasoline Association of America, Tulsa; H. M. Manley, Barnsdall Oil Company, Tulsa; W. H. Meier, The Atlantic Refining Company, Dallas; Ray E. Miller, Hanlon-Buchanan, Inc., Tulsa; William Moeller, Jr., Southern California Gas Company, Los Angeles; G. G. Oberfell, Phillips Petroleum Company, Bartlesville; E. L. Peck, Cities Service Oil Company, Bartlesville; E. F. Schmidt, Lone Star Gas Company, Dallas; F. M. Seibert, Gulf Oil Corporation, Houston; J. O. Sue, Humble Oil & Refining Company, Houston; M. B. Sweeney, Sun Oil Company, Dallas; M. E. Wagner, The Ohio Oil Company, Tulsa; P. G. Weidner, Stanolind Oil & Gas Company, Tulsa, and Frank Wells, Pacific Gas & Electric Company, San Francisco.

T. A. HENDRIX discussed "Structure of Ouachita Mountains" before the Ardmore Geological Society during the group's February meeting.

R. T. SHOEMAKER, sub-surface sales engineer in the East Texas, North Louisiana and Arkansas District, has been named to succeed Lloyd Tracy as manager of sub-surface sales for the Midwest Division of Oil Well Supply Company, with headquarters at Dallas. Shoemaker joined the company in 1936 as sucker-rod sales engineer after eight years as a chemist and metallurgist for National Tube Company. His practical experience followed five years of specialized university training in chemistry and metallurgy.

WARREN WEEKS, Phillips Petroleum Company, Shreveport, will address the weekly luncheon meeting of the Houston Geological Society at the Texas State Hotel, February 27, on "The Geology of the Schuler field, Arkansas, and Relationship to General Area."

O. H. POWELL, Texas superintendent for Stanolind Pipe Line Company, was temporarily homeless early last week when his residence on the outskirts of Fort Worth was destroyed by fire with a total loss of contents.

R. R. CRIDER is president of Southwest Machinery Company, a new corporation organized to take over distribution of Caterpillar Tractor Company products with headquarters at 1900 Linwood Boulevard, Oklahoma City. The company was organized as a result of a desire to retire on the part of H. S. von Elm, president of Oklahoma Tractor & Equipment Company, former distributor for Caterpillar Tractor Company.

Other officers of the distributorship are A. L. Robertson, former district representative for Caterpillar Tractor Com-

Officers of Southwest Machinery Company, Oklahoma City, left to right, R. R. Crider, president; R. L. Hoover, vice president; Ed. A. Butler, treasurer; R. L. Eldridge, secretary; William F. McCormick and A. L. Robertson, vice presidents.

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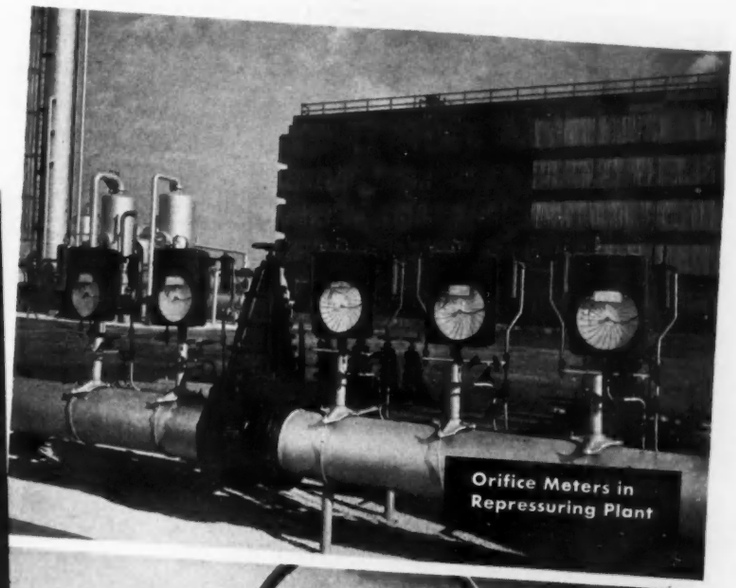
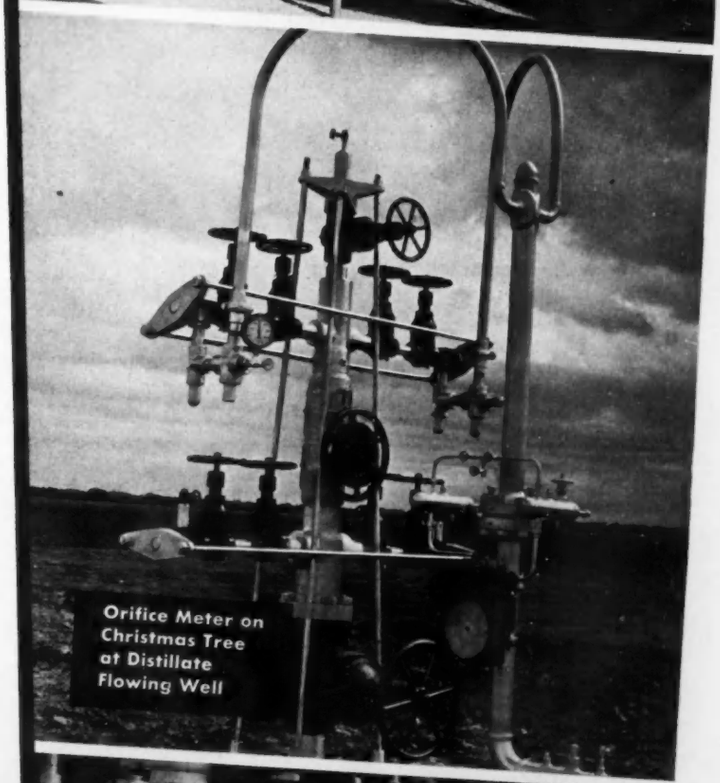
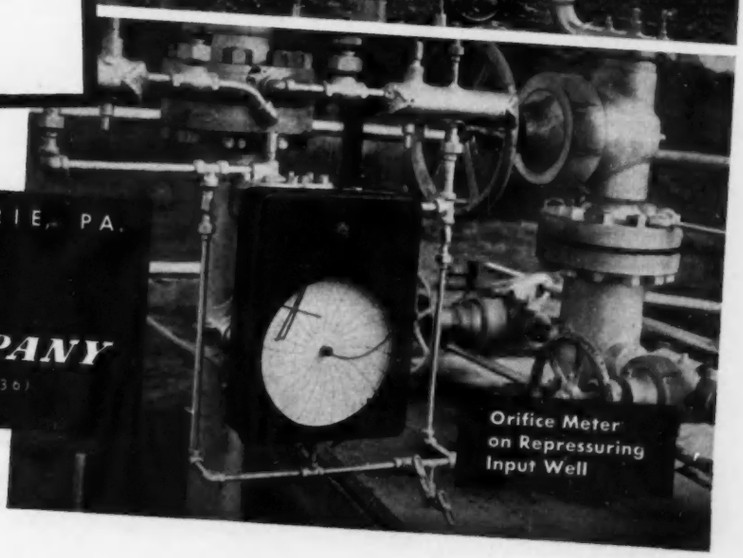


Orifice Meters in Repressuring Plant



Orifice Meter on Christmas Tree at Distillate Flowing Well



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MEN IN THE INDUSTRY'S NEWS

pany, vice president; William F. McCormick, vice president and Tulsa branch manager; R. L. Hoover, vice president; R. L. Eldridge, secretary, and Ed A. Butler, treasurer.

TOM E. ALEXANDER, in charge of Houston sales for Larkin Packer Company, St. Louis, has been named southern district sales manager. His territory includes Texas, New Mexico, Arkansas, Louisiana and Mississippi. Alexander, who began his oil industry career in 1929 in Texas fields, has been with Larkin Packer Company for the past 3½ years.

L. M. MOFFITT, Triangle Drilling Company, is chairman of the committee handling local arrangements for the spring meeting of the Southwestern District, American Petroleum Institute's Division of Production, being held this week in Shreveport. J. P. Straight, Cities Service Oil Company, is co-chairman, and members are R. M. Bass, Sinclair Prairie Oil Company; A. R. Campbell, Mid-Continent Oil & Gas Association; R. O. Garrett, Arkansas Fuel Oil Company; C. W. Hughes, Arkansas Fuel Oil Company; E. B. Miller, Jr., Tide Water Associated Oil Company; E. L. Rawlins, Union Producing Company; W. E. Schoeneck, The Ohio Oil Company, and George Weber, The Oil & Gas Journal.

A. H. Weyland, Arkansas Fuel Oil Company, is chairman of the finance committee, and is being assisted by J. J. Frommer, The Ohio Oil Company; Joe Goodman, Gulf Refining Company; R. H. Hargrove, United Gas Corporation, and J. R. McWilliams, Louark Producing Company.

Rawlins, as registration committee chairman, is being assisted by Phil Montgomery, Halliburton Oil Well Cementing Company, and O. C. Nonweiler, Louark Producing Company.

Chas. Mangold, Dowell, Incorporated, heads the entertainment committee. Assisting him are Bert Dowd, United Gas Corporation; R. T. Lewis, Hercules Motors Company; W. S. Morris, East Texas Engineering Association; Bonneau Peters, Louark Producing Company, and Garrett.

Hughes, as dinner-dance committee chairman, is being assisted by O. O. Beasley, Oil Well Supply Company; N. N. Jones, Humble Oil & Refining Company; D. M. Kerr, Lufkin Foundry & Machine Company; H. L. Kirkpatrick, Arkansas Fuel Oil Company; R. L. Long, Hughes Tool Company; M. L. Mayfield, Cotton Valley Operators Committee; Elmer Stewart, Pelican Well Tool & Supply Company; W. H. Ward, Norvell-Wilder Supply Company; W. H. Womack, Beaird Corporation, and Earl Wood, The Continental Supply Company.

Weber, chairman of the publicity committee, is being assisted by Leo Martin, Shreveport Times; John H. Murrell, Shell Oil Company; Charles Phillips, Shreveport Journal, and Guy Wetzel, The National Supply Company.

CHESTER H. WESTFALL, president, announces change in the name of Claude Drilling Company to Mercury Drilling Company. The company has offices in the National Bank of Tulsa Building, Tulsa.

A. S. RITCHIE, president of McPherson Drilling Company, and R. Bowland Richie, lawyer, both of Wichita, and H. O. Tice, Hutchinson, has incorporated Arrow Well Servicing Company, Wichita.

PAUL F. OSBORN has resigned as Illinois district geologist for Tide Water Associated Oil Company to enter private practice as a consulting geologist, with headquarters at 601 Citizens National Bank Building, Evansville, Indiana.

Southwest district sales representatives of Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company, Pittsburgh, held a sales meeting in Tulsa recently. Pictured attending the meeting are, left to right, in the front row: L. R. Van Arsdale; W. R. McLaughlin; F. A. Arnesen; A. E. Higgins, vice president in charge of sales; J. L. Cottrell; A. J. Kerr, district manager; A. D. MacLean, vice president and chief engineer; Roy R. Bush; O. W. Barnett, and Dean D. Collins. In the back row are, left to right: L. A. Babin, M. D. Gilbert, J. W. Northcutt, Herbert Parker, J. E. B. Lundy, Carl E. Baird, C. K. Madison, Glynn De Haas, F. N. Dillman and Tom Stacy.

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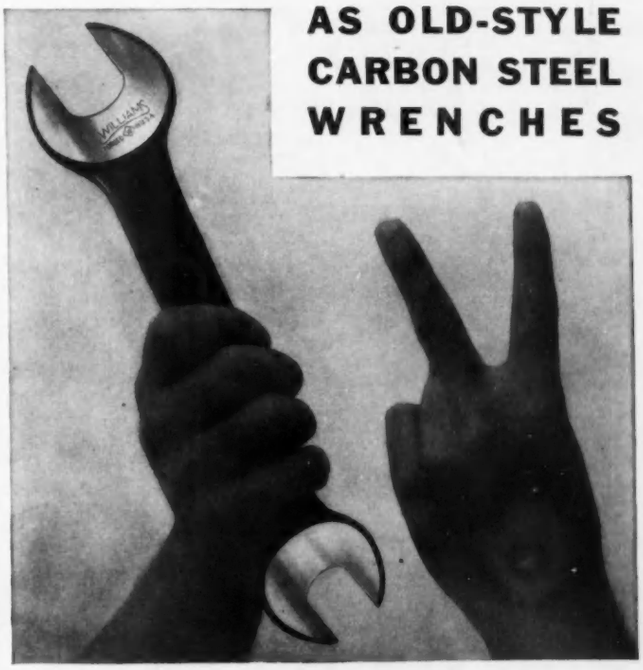

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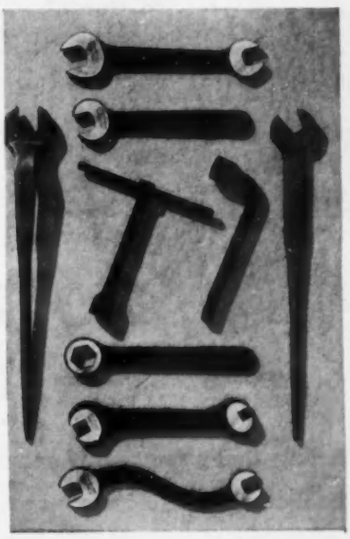

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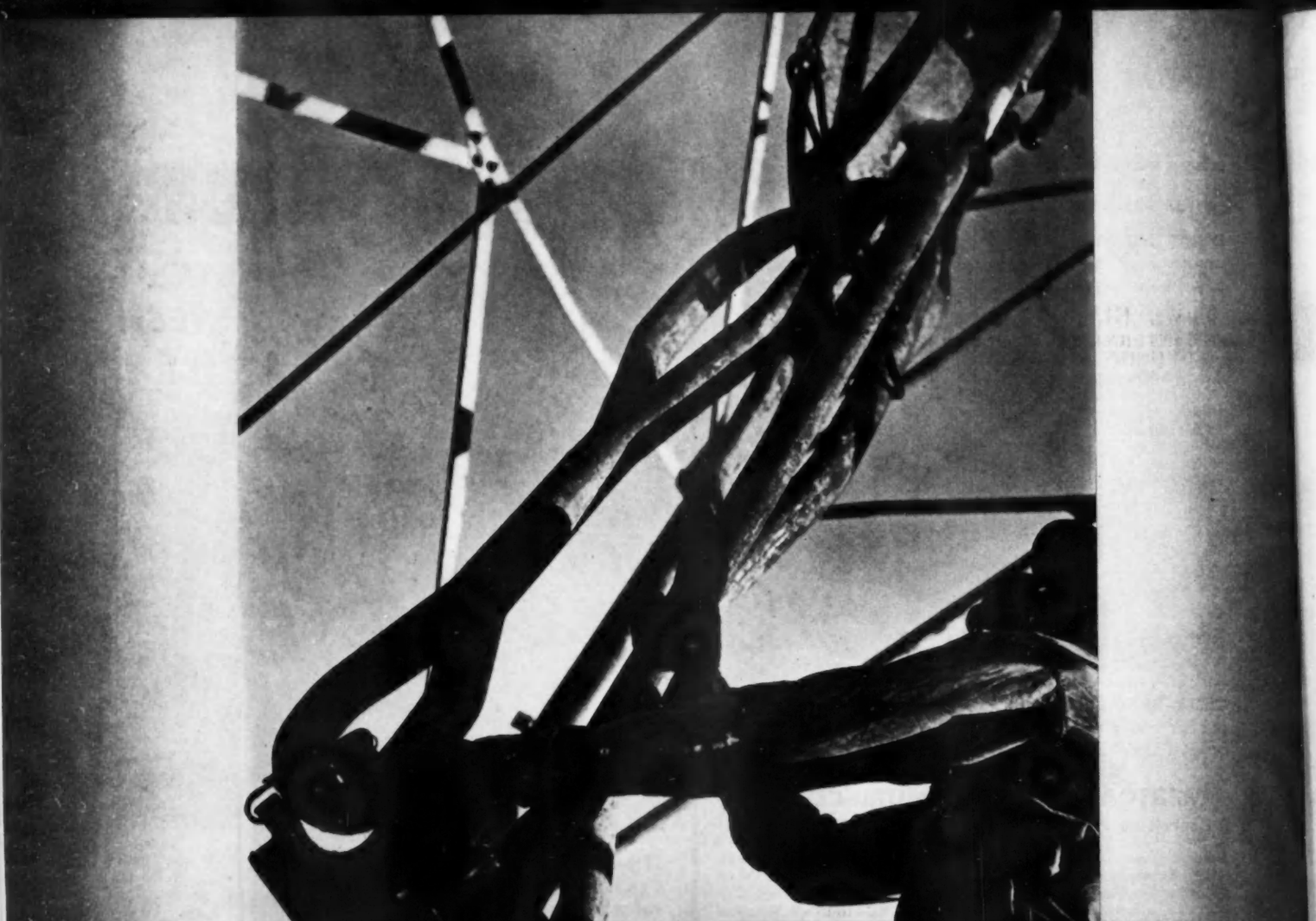

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Naturally this calls for something special in the way of toughness and strength in the material of which the body is made. And, as many drillers have discovered, cast Manganese-Molybdenum steel fits the requirements to a T. With its high tensile strength and good impact strength, this steel even permits reduced sections within the body, which brings about reduced weight and makes handling just that much easier.

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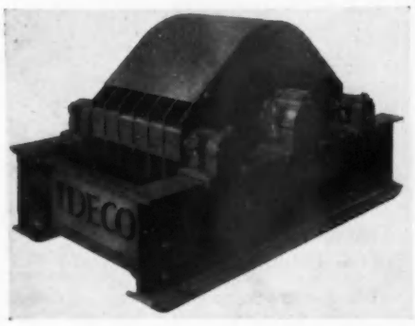
Crown Block

THE INTERNATIONAL DERRICK & EQUIPMENT COMPANY

A crown block designed for drilling in excess of 15,000 feet, designated Ideco giant crown block, has been announced by The International Derrick & Equipment Company, Beaumont, Texas.

It is offered with five or six 48-inch



Ideco Giant Crown Block

sheaves, mounted in heavy-duty roller bearings and individually lubricated. Sheaves are of chrome-nickel, chrome-nickel Hi-temper groove or manganese steel. They are interchangeable with sheaves in the company's Ideco giant traveling block.

Maps

E. C. JACOBSON

Two new maps of Oklahoma and Kansas oil fields have been announced by E. C. Jacobson, McBirney Building, Tulsa. Both are on a scale of one inch to eight miles, and show oil fields in green, gas fields in red, with indexes giving location of each field and names as designated by the Nomenclature Committee of the Mid-Continent Oil & Gas Association. Also shown are townships, ranges, county seats, cities and towns.

The Oklahoma map includes North Central Texas, while the Kansas map includes Western Missouri and the Falls City area of Nebraska. They are 35 x 55 inches.

Both maps are also available on a scale of 1 inch to 16 miles.

Boiler Stack

M&R SPECIALTIES COMPANY

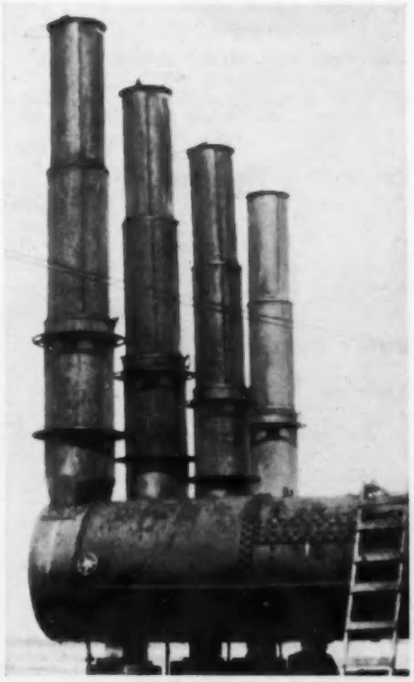
A telescopic boiler stack, designed to reduce the time required to erect and take down, has been announced by M&R Specialties Company, 1401 Elysian Street, Houston. Stack consists of three sections of equal length, fabricated of 10 gauge metal. Base of lower section is welded to a large ⅜-inch plate rolled to conform to boiler shell, and designed to provide rigidity sufficient to dispense with the usual stack guy wires.

The stack, which is not removed from the boiler for ordinary moving operations, is raised by winch line over gin poles on a truck, or by any similar method, hooking onto a bail on the upper section. Base section is provided with foot ring and hand-hold ring to support a workman. Latching of the sections is automatic, accomplished by weighted latches which trip as each section is extended to pin together the rings of 1½-inch angle iron welded inside the upper end and outside the lower end, of each section.

When stack is extended, the facing angle iron rings are designed to provide a tightly sealed joint, provide strength at the junctions, and keep the stack in alignment. When lowering the stack, latches may be tripped from the ground by a long hook. The stack may be lowered with winch line, or allowed to drop free as latches are released. Weight of the unit is 750 pounds for an 18-foot stack. Other sizes available are made of 4- and 5-foot sections, giving 12- and 15-foot stack heights, and assuring clearance when being moved on the roadway.

Remote Transmission

The Brown Instrument Company, Wayne & Roberts Avenues, Philadelphia, has issued Catalog 9400 on its New-Matic system of remote transmission. It discusses how, why, when and where the system may be applied for indicating, recording and control of temperature, pressure, flow and liquid level in hazardous atmospheres where use of electrical transmission is not desirable nor permissible. Photographs show the interior and exterior of the instruments, and schematic diagrams illustrate how they are applied for indicating, recording and control applications.



M&R Specialties' Boiler Stack

Meter

S. F. BOWSER & COMPANY

A meter that compensates measurement on a 60° F. basis, with adjusting scale covering API gravity from 6° to 90° and coefficient of expansion from 0.00035 to 0.0009, has been announced by S. F. Bowser & Company, Fort Wayne, Indiana.

Offered in two sizes, for 1½- and 2-inch

Bowser Compensating Meter

pipe, both operate at maximum pressures and temperatures of 50 pounds and 130°. The 1½-inch meter passes a maximum of 50 gallons per minute, the 2-inch meter passes 110 gallons. The small meter employs tapped female inlet connections, and the large meter is flanged.

Body of the meter, designated Model 764-AT, is cast iron, and pistons are of leather-sealed type. Compensation of measurement is accomplished by controlling the amount of liquid displaced, and there is no compensating of the recording mechanism.

Transmission Belt

MANHEIM MANUFACTURING & BELTING COMPANY

A flat transmission belt, designated Octopus and designed to combine maximum pulley grip to end slippage and great resilience to stop stretch, has been announced by Manheim Manufacturing & Belting Company, Manheim, Pennsylvania.

Combining 35-ounce duck with a special impregnating material, the belt is described as requiring no belt dressing. It is not recommended for oily drives.

Oil Burner

JOHN ZINK COMPANY

A mechanical oil burner, utilizing both primary and secondary air and requiring no special tile for installation, has been announced by John Zink Company, Tulsa.

In operation, primary air is drawn in through the center structural tube. Flow is controlled by an adjustable damper, the design providing a diffuser action to maintain ignition of the fuel at all ratings. Primary air flow cools the burner parts. Secondary air flows between a louver-type damper door and the wall thimble. The quantity of air is regulated by moving the damper door, and louvers on the damper

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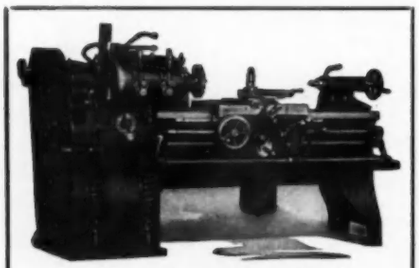


The Boye & Emmes Timken Bearing Engine Lathe

COMPLETE LINES

Machine Tools—Metal Working Machinery—Bolt and Pipe Threading Machines—Electric Arc Spot and Butt Welders—Hand Power and Electric Traveling Cranes—Foundry and Forge Shop Equipment.

C. J. HARTER, Machinery
4000 Clay, Houston, Texas
Fairfax 1466

THE Bolt Is Under Initial Stress Only!

•

THORNHILL-CRAVER COMPANY
HOUSTON

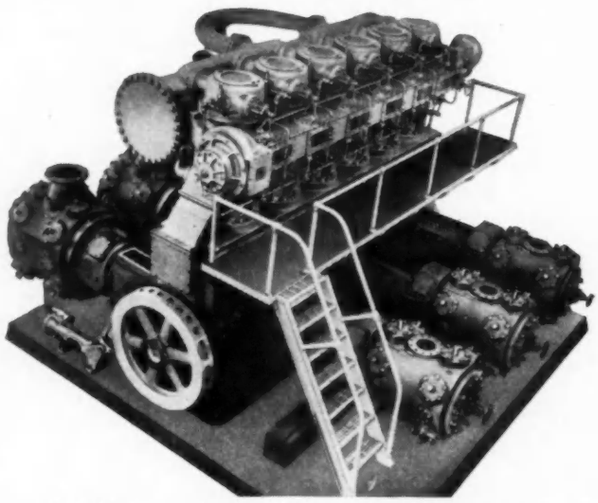
UNIBOLT
THE ONE BOLT COUPLING

NOTES FOR THE Equipment Buyer and User

door spin the secondary air to create turbulent flow.

Oil is atomized by delivering it under pressure ranging from 100 to 250 pounds to the atomizer head. Tangential slots in the passage to the discharge orifice spin the oil at a high velocity. A hollow cone of easily ignited oil mist is formed as the oil discharges. To further provide air-fuel mixture, the atomizer head is set so that the burning cone of oil mist almost fills the opening into the furnace.

The installation is made in round, sharp-edged openings turned in the furnace wall. Where gas fuel is to be used occasionally, separate gas guns are provided, to be inserted in place of the oil guns.



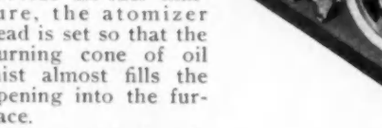
Clark's Steam Engine Driven Angle Compressor

Pipe Cutter

THE RIDGE TOOL COMPANY

A 4-wheel pipe cutter, designed for work in close quarters and for increased cutting speed, has been announced by The Ridge Tool Company, Elyria, Ohio.

Designated Model 42, it has been



Ridge Tool's Model 42 Pipe Cutter

built to cut iron, steel or brass pipe. Frame is of malleable alloy, and capacity of the tool is ½- to 2-inch.

Ventilating Equipment

Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, has issued Bulletin FU-41, illustrating and describing its complete line of cooling and ventilating equipment. Its 20 pages include installation and application data.

V-Belt Data Book

Fort Worth Steel & Machinery Company, Box 1038, Fort Worth, has issued a data book for plant engineers, superintendents and others concerned with problems of power transmission, covering multiple V-belt drive applications. Ratios, load capacity, frictional losses and other information are reduced to tables and graphs for quick and accurate reference.

Compressor

CLARK BROTHERS COMPANY

A line of steam engine-driven angle compressors, available in sizes from 600- to 4000-horsepower, has been announced by Clark Brothers Company, Olean, New York.

The compressors have three to six power cylinders and a corresponding number of compressor cylinders in practically any arrangement desired. Power ends of the units are equipped with Unaflow steam cylinders.

Vinson Supply Company Moves Dallas Office

Vinson Supply Company, Tulsa, has announced movement of its Dallas offices from the Tower Petroleum Building to 1302 Gulf States Building. Granville B. Lane is supervisor of the offices.

Elastic Stop SELF-LOCKING NUTS

FOR drilling, pumping, and other oil field equipment. Resilient locking collar prevents working loose under any condition of vibration or stress. Available in numerous types, all sizes, all standard threads, and any material. Get them from your supply house.

FACTORY STOCKS IN HOUSTON AND LOS ANGELES

Safe . . . Reliable . . . Economical

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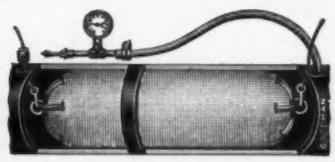
2320A VAUXHALL ROAD • UNION, NEW JERSEY

STOPPERS FOR OIL LINES



Send for catalogue

SAFETY GAS MAIN STOPPER CO.
523 Atlantic Ave. Brooklyn, N. Y.

NOTES FOR THE Equipment Buyer and User

Lane-Wells Company Acquires Olympic Products Company

Rodney S. Durkee, president of Lane-Wells Company, has announced purchase of the patents, packer and liner hanger stocks and good will of Olympic Products Company, Los Angeles and Houston. The newly acquired line of tools will be handled as Lane-Wells Company Olympic packers and liner hangers, and will be sold through all of the company's branch offices in the Gulf Coast, Mid-Continent and California fields. Manufacturing will be done in the company's Los Angeles plant, and stocks will be carried in each of the Division Headquarters.

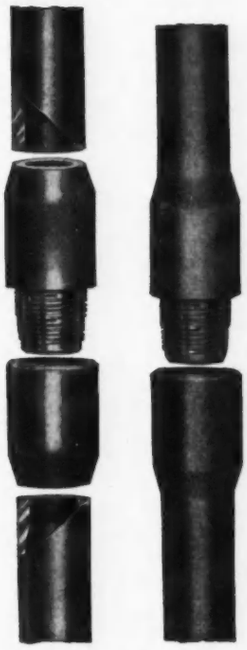
Hydril Company Announces Drill Pipe Pressure Welding

A new method of fabricating new drill pipe and of reconditioning used drill pipe by welding on alloy steel tool joint members, designated the pressure-weld process, is offered by Hydril Company, with service available at its factories at Houston and Torrance, California. Any type of drill pipe, either externally upset, externally and internally upset, or internally upset, can be fabricated or reconditioned, and any type of thread and tool joint connection of either standard or any oversize dimension can be supplied.

It has been found that abrasion by the formation and rig wear often impair the service of the tool joint connections of drill pipe while the pipe itself is still in safe condition for drilling. The pressure-weld process, as applied to reconditioning the drill pipe, consists of cutting off the ends of the pipe, leaving a short section of the upset, the end surface of which is machined flat and finished. A heavy alloy steel box or pin blank is then welded to the pipe under controlled, uniform conditions of pressure and temperature.

The welding operation is performed in automatic machines designed and constructed for this work. The machines incorporate chucks which hold and rotate both the drill pipe and tool joint blank in alignment all during the welding process, fixed rings of gas torches which heat the area of the weld both internally and externally before and during the formation of the weld, and powerful hydraulic jacks which unite the surfaces under pressure when welding temperature is reached. As is well known, welding takes place at low heat when high pressure is used. Low heat is employed in the process so as not to break down the structure of the metal, and no metal is supplied from an outside source. Controlled cooling follows the welding operation.

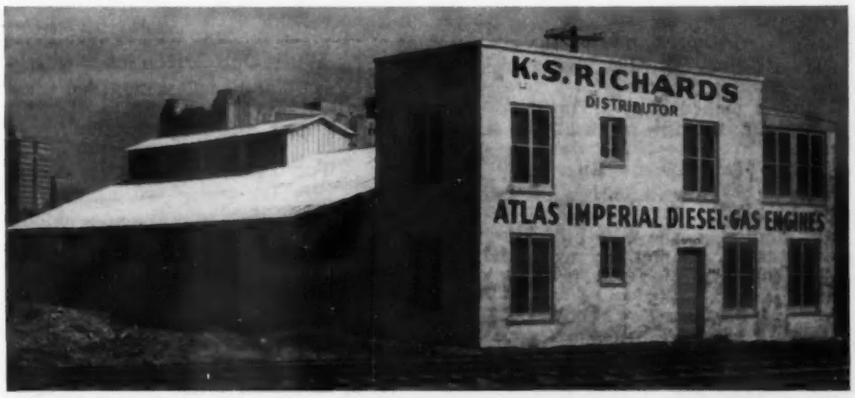
After welding, the joint is turned and bored to proper dimensions, threaded, and given a final refining heat treatment.



Drill pipe and tool joint members before and after pressure welding.

Liquid Level Gauges

The Bristol Company, Waterbury, Connecticut, has issued Catalog 1015 on its line of water and liquid-level gauges.



K. S. Richards, distributor for Atlas Imperial diesel engines, has consolidated his office, shops and warehouse stocks at 840 West Vickery, Fort Worth.

GET ACCURATE RESULTS
Quickly . . Easily . . with
CURTIN CENTRIFUGES

No. 3480 . . . 100 c.c. machine. Cranks and heads interchangeable with 15 c.c. machines.

You can maintain your required speed for the period of the test with much less effort. Curtin centrifuges, proven world-wide, are heavy duty, rigidly constructed, and extremely simple in design. Illustrated bulletin, giving full details, available upon request.

W·H·CURTIN & CO. Inc.
HOUSTON U·S·A TEXAS

Swift as a Swallow . . .

KIBELE SWAB
Hurries Down Through Fluid

An extra large fluid passage permits the Kibele Swab to sink swiftly. Fluid and gas pass around the outside of the cups as well as through the swab on the downward trip. Flexible rubber cups and a converging entrance to the valve cage aid in this rapid descent.

See Your Composite Catalog

KIBELE
MANUFACTURING COMPANY
5101 MAPLE AVE. DALLAS, TEXAS

HOW QUICKLY THE

MILLER

Clean-Out!

—sand and sediment, you will be surprised at the increased "*oil runs*" after cleaning-out with a MILLER—*the Sand Pump in World-Wide use!*

The MILLER is made in diameters of 2½, 3, 3½, 4, 4¼, 5, 5½, 7 and 9 inches and lengths of 20, 25 and 30 feet. 5/32-inch wall thickness in REGULAR Type. ¼-inch wall tubes HEAVY Type Sand Pumps.

INTERCHANGEABLE BOTTOMS

To Meet Every Condition

● BAILER BOTTOM

With the Bailer Bottom installed the MILLER is quickly changed to a Bailer giving you a combination of either Bailer or a Sand Pump in one tool.

● SAND BOTTOM

Used when tools are run and when well is shot to quickly remove loose material.

● STAR BOTTOM

Used for cutting the sand loose.

● CHISEL BOTTOM

(In Pump)

With this bottom tightly packed sand can be easily broken in small pieces so it can be picked up in the pump.

Write for Descriptive Folder and Price List

See Pages 1766-67 COMPOSITE CATALOG

MILLER

Sand Pump Co.

PATENTED NO. 1570348 NO. 1525606 NO. 1767890 NO. 1904648 NO. 1944826 NO. 2098697

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FOR SALE BY SUPPLY STORES EVERYWHERE

Squeaks from the Bull Wheel

Something About An Oil Man

There is something about an oil man which identifies him as an oil man, regardless of where he may be found or how dressed. Many new comers to the oil industry have discovered to their sorrow that it takes more than a leather coat and a pair of boots to make an oil man. Witness this story, told us by an engineer at the A.I.M.M.E. meeting in New York last week.

It happened in Paris. The engineer, who now lives in New York, had made the trip by taxi from a certain point to his hotel so frequently that he could tell the fare in his sleep—eight francs. One day he got out of the cab after making the trip and handed the driver a ten-franc note and started off. (It was typically an oil gesture to give the taxi-driver a 25 percent tip in a land of 10 percent.) But the cabby was not satisfied. He demanded 40 francs. The oil man demurred in typical oil fashion. The voice of the cabby shrilled louder and louder. As if by signal other taxi drivers came running. The American was up against it but he did not back down. Instead he backed up against a wall and told 'em to come on.

Suddenly there was a commotion. A man slightly smaller than Goliath appeared from nowhere and joined forces with the engineer—

"Come on, we'll take 'em," he exclaimed. A compatriot assailed by a mob was all the information he had—or needed.

"You're d . . . right we will," said the engineer—but the taxi-drivers, on seeing such formidable reinforcements quit the scene in a hurry.

"You talk like an oil man," said the newcomer. "My name is Tom O'Brien."

"I am an oil man—my name is Chester Narramore," said the engineer, and there began a friendship between two oil men whose travels had taken them over much of the world.

Comparison

"You hammer nails like lightning."

"You mean I'm a fast worker?"

"No; you never strike twice in the same place."

Indoor Sports

"What gives Parker that strained look—business worries?"

"No, he picked it up trying to listen to his wife and the radio at the same time."

And Livens Life

What is your favorite illustrated paper?

My choice is the $10 bill. It's big enough to buy something worth while and it isn't so big that nobody will change it.

Incomprehensible

"What does your wife shay when you shtay out late like thish?"

"Haven't got a wife."

"Then why do you shtay out late like thish?"

Important Candy

The old man in the theater dropped something and was making frantic efforts to recover it, when a woman next to him asked what he had lost.

"A caramel."

"You don't mean to tell me you are making all this fuss over a caramel?"

"Yes. My teeth are in it."

Appeaser

"What's the shape of the earth?" asked the teacher, calling suddenly upon Willie.

"Round."

"How do you know it's round?"

"All right," said Willie, "it's square, then. I don't want to start any argument about it."

Ties

Oh, some will say that a gent's cravet should only be seen, not heard. But I want a tie that will make men cry, and render their vision blurred.

I yearn, I long, for a tie so strong it will take two men to tie it. If such there be, just show it to me—whatever the price, I'll buy it!

Give me a tie—a wild, wild tie—one with a barrel of sins! A tie that will blaze in a hectic haze, down where the vest begins.

Judge No Gentleman

"Repeat the words the defendant used," said the lawyer for the plaintiff in a trial for slander.

"I'd rather not," replied the witness, timidly. "They are hardly words to tell a gentleman."

"I see," said the lawyer, understandingly. "Then you may whisper them to the judge."

We Wonder

I wish you wouldn't keep asking questions. Didn't you ever hear that curiosity killed the cat?

What did the cat want to know, father?

All On End

Visitor: "My, what a large skating rink!"

Instructor: "Yes. It has a seating capacity of 5000."

With One Exception

"Why, he's the loudest mouthed man I ever heard."

"Shush, dear, you forget yourself."

Too True to Be Good

"My boss takes the worst possible view of everything."

"Oh, a pessimist, eh."

"No, a candid camera fiend."

Right Answer

How did the wedding come off?

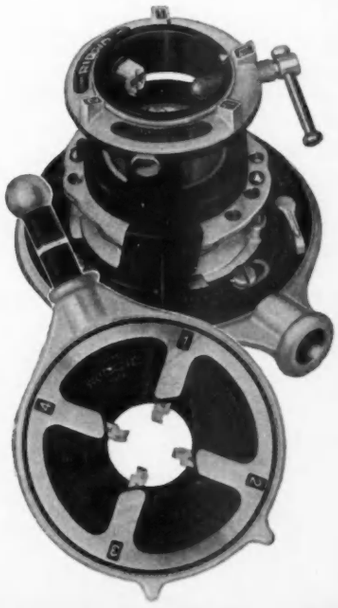
Fine until the minister asked the bride if she would obey her husband.

What happened then?

Plenty. The bride replied: "Do you think I'm crazy?" and the groom, who was in a sort of daze, answered: "I do."

Do more work with less effort in 1941

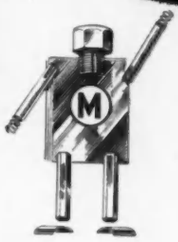
You Set this Work-Saver RIDGID No. 65R-C to thread 1" to 2" Pipe *in 10 Seconds*



MUCH less work with this smooth threading new all-steel and malleable-alloy RIDGID, with high-speed steel dies. • Shifts to 1", 1¼", 1½" or 2" pipe in 10 seconds—one set of chaser dies, no extras to lug around or lose. Threads easily—a little finger can turn it. • No lost time backing off—special lever releases dies. Quick setting for drip threads, close nipples. Automatic mistake-proof work-holder—no bushings. • Your men do more without extra strain with time-and-work-saver RIDGIDs. Buy at your Supply House. *The Ridge Tool Company, Elyria, O.*

RIDGID
WORK-SAVING PIPE TOOLS

How to cut "Down Time" and boost Production



use MONEL

This tough, corrosion-resistant High-Nickel Alloy stands up in severest service

In ordering oil field equipment and accessories, what kind of *metal* do you specify? It pays to insist on the kind that *stays on the job* and so *decreases down time* . . . Monel.

This high-nickel alloy combines exceptional toughness and strength with great resistance to abrasion and corrosion. As a result, Monel withstands the destructive attack of hydrogen sulphide and brine, the cutting action of high-pressure gas, abrasion by sand particles, and severe stresses and shock.

Possessing tensile strength over 130,000 p.s.i. and exceptional toughness, Monel proves a long-lived material for equipment of the type listed below. Write for detailed information. Ask for Bulletin T-5, "Engineering Properties of Monel." Address:

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York, N.Y.

"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.

MONEL IMPROVES THE PERFORMANCE OF

Polished Rods (Solid)	Springs
Polished Rods (Jacketed)	Working Barrels
Regulator Parts	Accessories
Mud Screens	Gas Lift Valves
Pressure Gauges	Gauging Equipment

INDEX TO ADVERTISERS

*** Indicates that detailed information on the manufacturer's products or services may be found in the 1941 edition of The Composite Catalog of Oil Field & Pipe Line Equipment.**

A — Page

*Abercrombie Pump Co. ... 84
*Acme Fishing Tool Co. ... —
*Advanced Petroleum Equipment Corp. ... —
Air Reduction Sales Co. ... —
*Ajax Iron Works ... —
*Alten's Foundry & Machine Works ... —
Aluminum Company of America ... —
Aluminum Ore Co. ... —
American Assn. of Petroleum Geologists ... —
*American Cable Division of American Chain & Cable Co. ... —
American Cast Iron Pipe Co. ... —
*American Hammered Piston Ring Division of Koppers Co. ... —
American Hoist & Derrick Co. ... 70
*American Iron & Machine Works Co. ... —
*American Meter Co. ... 99
*American Sand-Banum Co. ... 101
*American Steel & Wire Co. ... 83
Atlas Drop Forge Co. ... —
Atlas Powder Co. ... —
Atlas Supply Co. ... —
Axelson Manufacturing Co. ... —

B

*Baash-Ross Tool Co. ... —
*Baker Oil Tools, Inc. ... —
*Baroid Sales Division ... 71
William M. Barret, Inc. ... 98
*The Barrett Co. ... —
*Bartlett-Hayward Division of Koppers Co. ... —
*Bethlehem Steel Co. ... —
*Bethlehem Supply Co. ... 47
*Braden Steel Corp. ... —
*The Brewster Co. ... 81
The Bridgeport Machine Co. ... —
*Broderick & Bascom Rope Co. ... —
*Brown Oil Tools, Inc. ... —
*The Buckeye Traction Ditcher Co. ... —
*Bucyrus-Erie Co. ... —
*The Buda Co. ... Third Cover
*Butler Manufacturing Co. ... —
*Byron Jackson Co. ... —

C

Jo H. Cable ... —
*Cameron Iron Works ... 75
*Cardwell Manufacturing Co. ... 30- 31
Carnegie-Illinois Steel Corp. ... —
*Caterpillar Tractor Co. ... —
*Cavins Bailer Service of Texas ... 100
*Chain Belt Co. ... 73
*Clark Bros. Co. ... —
*Climax Molybdenum Co. ... 102
*Coffing Hoist Co. ... —
Columbia Steel Co. ... 83
Continental Oil Co. ... —
The Continental Supply Co. ... —
*Fred E. Cooper Co. ... —
*The Cooper-Bessemer Corp. ... —
Crane Co. ... —
W. H. Curtin Co. ... 105

D

*Darling Valve & Manufacturing Co. ... —
Dedman Foundry & Machine Co. ... 80
*Diamond Chain & Manufacturing Co. ... —
*Dixon Valve and Coupling Co. ... —
*Dowell Incorporated ... —
*The Dragon Manufacturing Co. ... —
*E. I. du Pont de Nemours & Co. ... —

E

*Eastman Oil Well Survey Co. ... —
Economy Electric Lantern Co. ... —
*Elastic Stop Nut Corp. ... 104
*Engineering Laboratories, Inc. ... —

F

Failing Exploration & Drilling Co. ... 104
First National Bank in Dallas ... —
First National Bank in Houston ... —
First National Bank & Trust Co. of Tulsa ... —
Fluid Packed Pump Co. ... —
Ford Motor Co. ... —
The Fort Worth Clearing House Association ... —
The Fort Worth Laboratories ... 96
Fort Worth Steel & Machinery Co. ... —
*Franks Manufacturing Corp. ... —
Frick-Reid Supply Corp. ... —
Frost National Bank ... —

G

*Gardner-Denver Co. ... 43
*The Garlock Packing Co. ... —
*Gaso Pump & Burner Manufacturing Co. ... 57
*Gatke Corp. ... —
General American Transportation Corp. ... —
*General Electric Co. ... —
General Geophysical Co. ... —
General Motors Sales Corp. ... 49
Geological Scientific Service Co. ... —
Geophysical Service, Inc. ... 59

Page

Goetze Gasket & Packing Co. ... —
*Goodyear Tire & Rubber Co. ... —
*H. P. Gott Manufacturing Co. ... —
*Gray Tool Co. ... —
*Green Head Bit & Supply Co. ... 37
Howard Greene Torpedo Co. ... —
*The Guiberson Corp. ... 52
*Gulf Coast Machine & Supply Co. ... —
Gulf Coast Petroleum Laboratory ... 100
Gulf Envelope Co. ... —
Gulf Oil Corp. ... —
*Gulf Publishing Co. ... 63
Gunter Hotel ... —

H

*Halliburton Oil Well Cementing Co. ... —
Hardway & Cathey ... 96
C. J. Harter, Machinery ... 104
*Haynes Stellite Co. ... 38
*Hazard Wire Rope Division of American Chain & Cable Co. ... —
Heidie's Machine Works ... —
The Hercules Powder Co. ... 99
*Hewitt Rubber Corp. ... —
*Hobbs Manufacturing Co. ... —
Hollywood Plaza Hotel ... —
Houston Laboratories ... 96
Houston Pipe Appliances Co. ... —
*Hughes Tool Co. ... First Cover
Humble Oil & Refining Co. ... —
*Hunt Tool Co. ... 55
Hyatt Bearings Division ... 49

I

Independent Exploration Co. ... —
Industrial Engineering Service ... —
*Ingersoll-Rand Co. ... —
*International Harvester Co. ... —
The International Nickel Co. ... 107

J

Jarecki Manufacturing Co. ... —
*Jensen Brothers Manufacturing Co. ... 85
*Johns-Manville ... 88
*M. O. Johnston Oil Field Service Corp. ... —
Jones & Laughlin Steel Corp. ... Second Cover

K

Kansas Gas & Electric Co. ... —
*Kerotest Manufacturing Co. ... —
*Keuffel & Esser Co. ... 69
*Kibele Manufacturing Co. ... 105
*Kinzbach Tool Co. ... —
*Kobe, Inc. ... 8
*Koppers Co. ... —

L

Lamtex Equipment Corp. ... 70
Landis Machine Co. ... —
*Lane-Wells Company ... —
*Larkin Packer Co. ... 10
*The Thomas Laughlin Co. ... —
*The Layne & Bowler Co. ... —
Lebanon Steel Foundry ... 90
*Le Roi Co. ... —
*A. Leschen & Sons Rope Co. ... —
*The Lincoln Electric Co. ... 29
*Line Scale Co. ... —
*Link-Belt Co. ... 1
Lone Star Cement Corp. ... —
*Lucey Boiler & Manufacturing Co. ... —
*Lucey Export Corporation ... —
*The Ludlow Valve Manufacturing Co. ... —

M

Macwhyte Co. ... —
*Maintenance Engineering Corp. ... 98
*Martin-Decker Corp. ... —
P. R. Mallory & Co., Inc. ... —
The Marley Co. ... —
Marmon-Herrington Co. ... —
*John N. Martin, Manufacturer ... 93
*McEvoy Co. ... 77
*McKissick Products Corp. ... —
*Merco Centrifugal Co. ... —
*Merco Nordstrom Valve Co. ... —
*Merla Tool Corp. ... —
*Metric Metal Works ... 99
*Miller Sand Pump Co. ... 106
*Minneapolis-Moline Power Implements Co. ... —
*Mission Manufacturing Co. ... Fourth Cover
*Morse Chain Co. ... 6
Mott-Smith Corp. ... —
The Jno. Muller Co. ... —
Murray Rubber Co. ... —

N

National Bank of Tulsa ... —
*National Lead Co. ... 71
The National Supply Co. ... 34- 35
National Tube Co. ... 4- 5
Nicholson File Co. ... —
Norvell-Wilder Supply Co. ... —
*Novo Engine Co. ... —
*Oil Center Tool Co. ... —

O — Page

*Oil City Brass Works ... 51
Oil Industry Mailing List Co. ... —
Oil Well Supply Co. ... 3
*Otis Pressure Control, Inc. ... 87

P

*The Parkersburg Rig & Reel Co. ... —
*Patterson-Ballagh Corp. ... 95
*Pelican Well Tool & Supply Co. ... 89
Petroleum Electric Power Assn. ... —
Petroleum Rectifying Co. of California ... 7
*Pittsburgh Equitable Meter Co. ... —
*Pittsburgh Steel Co. ... —
Plymouth Cordage Co. ... —

Q

*Quaker Rubber Corp. ... 98

R

Reading-Pratt & Cady Division of American Chain & Cable Co. ... —
*Rector Well Equipment Co. ... —
*Reda Pump Co. ... —
*Reed Roller Bit Co. ... Insert, 44- 45
*Regan Forge & Engineering Co. ... —
Republic National Bank ... —
Republic Steel Corp. ... 67
*The Ridge Tool Co. ... 107
*John A. Roebling's Sons Co. ... —

S

Safety Gas Main Stopper Co. ... 104
Jack A. Schley ... 96
*Schlumberger Well Surveying Corp. ... —
The Second National Bank of Houston ... —
*Security Engineering Co. ... —
Seismic Exploration Co. ... —
Seismograph Service Corp. ... —
*Shaffer Tool Works ... —
Shell Oil Co., Inc. ... —
Shilstone Testing Laboratory, Inc. ... 96
*SKF Industries, Inc. ... —
A. O. Smith Corp. ... —
*E. M. Smith Co. ... 82
*South Chester Tube Co. ... —
Southern Engine & Pump Co. ... —
Southern Pacific Lines ... 2
Spang Chalfant, Inc. ... —
*Spang & Company ... —
*Sperry-Sun Well Surveying Co. ... —
*Standco Brake Lining Co. ... —
*Star Drilling Machine Co. ... —
Straus-Bodenheimer Co. ... —

T

Taylor Forge & Pipe Works ... —
E. C. Tecktonius Manufacturing Co. ... —
*Templeton, Kenly & Co. ... —
Texaco Development Corp. ... —
The Texas Co. ... —
Texas Electric Steel Casting Co. ... —
The Thermoid Co. ... —
Thompson Tool Co. ... —
*Thornhill-Craver Co. ... 104
*The Timken Roller Bearing Co. ... —
Edgar Tobin Aerial Surveys ... —
*Tretolite Co. ... —
Trinity Portland Cement Co. ... —
Tulsa Shock Absorber Co. ... —
*Twin Disc Clutch Co. ... 86

U

*Union Carbide & Carbon Corp. ... 38
*Union Wire Rope Corp. ... —
*Unit Rig and Equipment Co. ... —
*United States Rubber Co. ... —
United States Steel Corp. ... 3, 4-5 and 83
*Universal Atlas Cement Co. ... —
*Universal Engineering Co. ... —

W

P. A. Ward & Co. ... —
Warner & Swasey Co. ... —
*Waukesha Motor Co. ... —
Well Surveys, Inc. ... —
Western Electric Co. ... —
*Westinghouse Electric & Manufacturing Co. ... —
*Wheeling Machine Products Co. ... —
*The Wheland Co. ... —
Whitney National Bank ... —
Wichita Engineering Co. ... —
*Wickwire Spencer Steel Co. ... —
*J. H. Williams & Co. ... 101
*Wilson Manufacturing Co. ... —
Wilson Supply Co. ... —
*Wisconsin Motor Corp. ... —
*Witte Engine Works ... —
*Worthington Pump & Machinery Corp. ... —
Wyatt Metal & Boiler Works ... —

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York Oil Field Supply Co. ... 100
Youngstown Sheet & Tube Co. ... —